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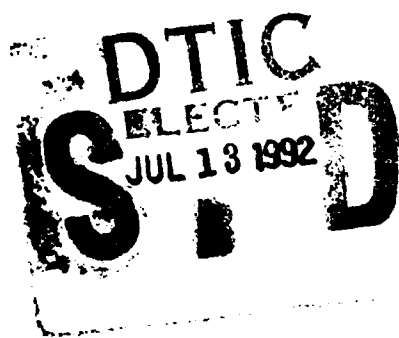
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# NAVAL POSTGRADUATE SCHOOL

## Monterey, California

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### THESIS

APPLICATION OF OPTICAL DISC DATABASES  
AND RELATED TECHNOLOGY  
TO PUBLIC ACCESS SETTINGS

by

David Foster DeFord

March, 1992

Thesis Advisor:

Barry A. Frew

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92 7 1 076

92-18204



REPORT DOCUMENTATION PAGE			
1a REPORT SECURITY CLASSIFICATION UNCLASSIFIED		1b. RESTRICTIVE MARKINGS	
2a SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.	
2b DECLASSIFICATION/DOWNGRADING SCHEDULE			
4 PERFORMING ORGANIZATION REPORT NUMBER(S)		5. MONITORING ORGANIZATION REPORT NUMBER(S)	
6a NAME OF PERFORMING ORGANIZATION Naval Postgraduate School	6b. OFFICE SYMBOL (If applicable) 37	7a. NAME OF MONITORING ORGANIZATION Naval Postgraduate School	
6c. ADDRESS (City, State, and ZIP Code) Monterey, CA 93943-5000		7b ADDRESS (City, State, and ZIP Code) Monterey, CA 93943-5000	
8a NAME OF FUNDING/SPONSORING ORGANIZATION	8b OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8c ADDRESS (City, State, and ZIP Code)		10 SOURCE OF FUNDING NUMBERS	
		Program Element No	Project No
		Task No	Work Unit Accession Number
11 TITLE (Include Security Classification) APPLICATION OF OPTICAL DISC DATABASES AND RELATED TECHNOLOGY TO PUBLIC ACCESS SETTINGS			
12 PERSONAL AUTHOR(S) David Foster DeFord			
13a TYPE OF REPORT Master's Thesis	13b TIME COVERED From To	14 DATE OF REPORT (year, month, day) 1992, March	15 PAGE COUNT 225
16 SUPPLEMENTARY NOTATION The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
17 COSATI CODES		18 SUBJECT TERMS (continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUBGROUP	
		Optical Disc, Compact Disc-Read Only Memory, CD-ROM, Public Access, Library	
19 ABSTRACT (continue on reverse if necessary and identify by block number) Recently developed optical disc technology offers economical, convenient, and durable storage of large quantities of data. Advanced data retrieval software allows rapid search of optical discs. A number of commercial and government publishers produce optical disc databases offering enhanced direct access to data, text or large reference indexes. In library settings direct patron access to optical disc databases has proven popular. This paper examines issues a librarian or information manager should consider before and during implementation of public access optical disc databases. It documents results of a trial optical disc implementation at the Naval Postgraduate School's Dudley Knox Library and a product survey identifying candidate optical disc database products for library use. Computer hardware options for distribution of information from optical discs are discussed. A strategy is presented for further implementation of optical disc databases in the Dudley Knox Library.			
20 DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS REPORT <input type="checkbox"/> LIMIT USERS		21 ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a NAME OF RESPONSIBLE INDIVIDUAL Barry A. Frew		22b TELEPHONE (Include Area code) (408) 646-2392	22c OFFICE SYMBOL Code 05

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Application of Optical Disc Databases and Related Technology  
to Public Access Settings

by

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Submitted in partial fulfillment  
of the requirements for the degree of


MASTER OF SCIENCE IN INFORMATION SYSTEMS MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL


March, 1992


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**ABSTRACT**

Recently developed optical disc technology offers economical, convenient and durable storage of large quantities of data. Advanced data retrieval software allows rapid search of optical discs. A number of commercial and government publishers produce optical disc databases offering enhanced direct access to data, text, or large reference indexes. In library settings direct patron access to optical disc databases has proven popular. This paper examines issues a librarian or information manager should consider before and during implementation of public access optical disc databases. It documents results of a trial optical disc implementation at the Naval Postgraduate School's Dudley Knox Library and a product survey identifying candidate optical disc database products for library use. Computer hardware options for distribution of information from optical discs are discussed. A strategy is presented for further implementation of optical disc databases in the Dudley Knox Library.



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## I. INTRODUCTION

### A. BACKGROUND

In recent years, optical disc technology has emerged as a viable method of disseminating large quantities of information in a convenient and inexpensive manner. The volume of data stored or published on optical disc is growing rapidly, as commercial publishers, government agencies, and industrial firms identify applications appropriate to various optical disc formats.

Adequate standards have evolved within the optical disc industry to support production of mutually compatible, microcomputer based optical disc readers (drives), discs and applications by numerous manufacturers and publishers. One set of those standards defines the Compact Disc-Read Only Memory (CD-ROM) format.

Databases published on CD-ROM have gained broad acceptance in libraries, where they provide improved access to information previously available only in print or microform formats, or through use of relatively expensive searching of commercial online computer databases. Many libraries make CD-ROM databases available to patrons for end-user searching.

## **B. OBJECTIVES AND RESEARCH QUESTIONS**

The primary objective of this thesis is to define a strategy for implementation of public access CD-ROM databases at the Naval Postgraduate School's Dudley Knox Library. Although two CD-ROM products were in use by library staff members in the Acquisitions and Research Reports departments, no public access optical disc services were offered to patrons by the Dudley Knox Library prior to the installation of a trial CD-ROM workstation in connection with this thesis research. The above objective is reflected in the primary research question: What is a recommended strategy for establishing and maintaining public access optical disc database resources? Subsidiary research questions include:

- What optical disc databases should be made available to library patrons in support of student and faculty research?
- What level of user demand for optical disc database resources may be expected at the Dudley Knox Library?
- What alternative hardware configurations are available to support library public access optical database requirements and what are their respective advantages and disadvantages?
- What implementation and library management issues should be considered coincident with establishment of public access optical database resources at a library?

### **C. SCOPE AND LIMITATIONS**

Although there are potential library applications of several different optical disc formats, including CD-ROM, Write Once Read Many (WORM) and Laservision, the scope of this thesis is confined to CD-ROM applications (except for a brief overview of other formats and the history of optical disc technology [Chapter II]). Therefore, where applied beyond Chapter II, the terms "optical disc" and "CD-ROM" may be considered equivalent within the context of this thesis.

In order to realize the stated primary objective, the conclusions and recommendations offered will be specifically directed to the Dudley Knox Library setting. To provide adequate background for those conclusions and recommendations, discussion of CD-ROM implementation issues and hardware options is necessarily broad, drawing upon the documented experience of librarians and technical specialists in diverse settings.

### **D. METHODOLOGY**

A majority of the research conducted for this thesis was intended to provide the author (and readers) with a broad understanding of practices and issues relevant to library public access optical disc database implementation. Additional research focused on identification of CD-ROM databases, from commercial and government publishers, of potential value in the specific setting of the Dudley Knox



Library. A trial CD-ROM database implementation was conducted in the Dudley Knox Library. Together, these activities provided a basis for recommendations addressing the research questions identified above.

Initial research focused on general library CD-ROM implementation issues. A series of interviews was conducted with librarians and computer support technicians at ten post-secondary educational institutions. Interview discussions focused on issues identified through review of the literature pertaining to library CD-ROM applications. Identification of a list of candidate CD-ROM databases for implementation in the Dudley Knox Library was accomplished through a product survey conducted with the support of the Library's Reader Services and Research Reports Librarians. In conjunction with that survey, a draft CD-ROM Collection Development Policy was produced. The survey results and Collection Development Policy together provide a foundation for further CD-ROM collection development activity at the Dudley Knox Library.

A three month trial implementation of *Computer Select*, a CD-ROM database published by Ziff Communications Company, provided an opportunity to supplement literature reviews with direct public access CD-ROM experience in the unique environment of the Dudley Knox Library.

## **E. ORGANIZATION OF STUDY**

This thesis begins with an overview of optical disc technology, its history and applications. Subsequent chapters describe the interviews, product survey and trial CD-ROM database implementation mentioned above. An overview of CD-ROM implementation issues is presented next, drawing from both the literature and interviews. Finally, recommendations are provided for implementation of public access CD-ROM databases in the Dudley Knox Library.

## II. HISTORY OF OPTICAL DISC TECHNOLOGY AND APPLICATIONS

### A. EARLY HISTORY

The history of optical disc technology begins with Baird. In 1923, he began experimentation with mechanical optical scanners and display devices (Elshami 1990, 8). His technique involved transfer of an image to a wax disc, with subsequent reproduction of the image by employing a receiver with a modulated neon bulb. In 1935, he briefly marketed a video disc system called *Baird Radiovision*, which offered six minutes of program material (Buddine and Young 1987, 11).

Interest in optical disc technology was rekindled in the late 1950's. In 1958, Paul Gregg experimented with optical disc electron beam film recording (Buddine and Young, 1990, 11). Three years later, the 3M Company joined with Stanford Research Institute to study home video system development. This effort involved use of mercury and xenon lamps recording on silver halide discs (Elshami 1990, 9). 3M was successful in producing high quality (but expensive) recordings and by 1964, demonstrated the ability to transfer motion picture or television imagery to disc (Elshami 1990, 9).

These early projects appear to have been directed at the consumer market. None of them resulted in mass produced systems. As a result, none prompted generation of a body of optical disc applications.

#### **B. LASER VIDEODISC**

The invention of the laser in 1961 provided the technological underpinnings of current optical disc storage media. In the early 1970's, Phillips Research Laboratories and MCA independently developed video disc systems, using a laser to inscribe pits of varying length on a disc (Buddine and Young 1987, 12). Duplicate plastic discs could be economically reproduced from a master, providing durable read-only recordings. A complementary video disc player uses a less powerful laser to illuminate the "pits" and adjacent "lands" on the disc surface (Elshami 1990, 8). Variations in reflected light intensity are then decoded to reproduce the recorded signal (Elshami 1990, 4-5). Phillips and MCA reached agreement on a common video disc software format in 1974 and cooperated to produce dual-sided discs offering 60 minutes of playing time (Buddine and Young 1987, 12). This agreement formed the basis of a commercially successful laser video disc standard. Later refinements increased disc capacity, improving the utility of the medium (Elshami 1990, 12). Rapid advancement in laser technology

allowed Phillips/MCA to market home video disc players under the *Laservision* product name (Buddine and Young 1987, 12).

*Laservision* was developed for the consumer market place. When it was introduced, the only other economical means for home distribution of video programming was broadcasting (Buddine and Young 1987, 13). *Laservision's* potential for wide market success however, was severely muted by the appearance of affordable home video cassette recorders (VCRs) (Buddine and Young 1987, 13). Now marketed by Pioneer, it retains a niche in the home entertainment market and has expanded into educational and industrial applications in an evolved format called interactive videodisc (IVD) (Elshami 1990, 12). Highly effective as a training tool, IVD links the interactive features of the personal computer to *Laservision's* high quality still/motion picture and audio capabilities (Elshami 1990, 12). An analog format laser videodisc may be used to store a gigabyte of digital data per side on a 12 inch disc (Eaton, McDonald and Saule 1989, 4). Known as digital videodisc, the most common of these systems is marketed by LaserData (Eaton, MacDonald and Saule 1989, 4).

### C. COMPACT DISC DIGITAL AUDIO (CD or CD-DA)

In 1974, during development of *Laservision*, Phillips Research Laboratories began to study recording of audio signals on laser disc in a digital format (Elshami 1990,

14). While the technology for producing the discs would be similar to that employed by *Laservision*, the pits and lands inscribed in the disc surface would provide digital encoding of bits (representing 1's and 0's) (Elshami 1990, 14). This method provides distortion free audio reproduction (a hallmark of CD). In 1980, Phillips and Sony jointly announced a "standard" CD format, subsequently dubbed the "Red Book" (from the color of its cover) (Elshami 1990, 15). The Red Book gained rapid world-wide acceptance as a true industry standard. Every audio CD complies with it, with resultant obvious advantages to the consumer, CD producers, and CD player manufacturers.

CD audio introduced the now-familiar 4.72 inch (12 cm) polycarbonate plastic disc. The digital signal is inscribed in the plastic, which is then overlaid by a thin layer of reflective aluminum and a clear protective resin (Elshami 1990, 15). The resulting disc is read-only, and may be used in any CD player designed in accordance with the Red Book (the first of which was marketed in 1982) (Elshami 1990, 15). CD players are self-contained, converting the digital signal on the CD to an analog audio signal that can be amplified by conventional means to drive speakers.

As with its *Laservision* cousin, CD was targeted at the home market. Unlike *Laservision*, it has become the predominate medium in its intended market. CD audio "has essentially ended the reign of the vinyl record and has

substantially impacted on the recorded music market" (Bonime 1991, 18). Miller (1986, 39) notes that ". . . compact disc has been cited as the most successful consumer electronic product introduction in history." As of 1986, a videodisc player could be found in about one percent of U.S. households (Buddine and Young 1987, 13).

#### **D. COMPACT DISC - READ ONLY MEMORY (CD-ROM)**

Phillips and Sony continued their collaboration in optical disc technology with development of a standard for digital storage of image, audio, or textual data on compact disc for use as a mass storage computer peripheral. In 1983, they announced CD-ROM technology and two years later published the Yellow Book standard (Elshami 1990, 16). The Yellow Book defines the arrangement of the physical bit structure of a CD into sectors suitable for computer data storage (Einberger 1987, 32). The size and construction of the CD-ROM disc duplicates the audio disc (Laub 1986, 57). The Yellow Book also includes an effective error correction scheme; an important requirement for computer applications (Elshami 1990, 30). This standard enables any CD-ROM disc to be read by any CD-ROM drive (Ciuffetti 1991a, 27).

The Red Book provides a comprehensive standard for CD, with the noted commonality among all CD products. The Yellow Book, conversely, does not fully standardize CD-ROM. It leaves undefined the logical format of the disc, which

specifies the organization of disc sectors into logical blocks of data and files (Buddine 1987, 368). Each producer of a CD-ROM application may create a unique file structure tailored to the needs of his application and the operating system of the host computer (Einberger 1987, 41). Each application may therefore require use of developer-specified data retrieval software (Einberger 1987, 31-32,41) . While this arrangement makes CD-ROM more flexible than CD, it also reduces standardization (Buddine and Young 1987, 20). To address this issue, a group of CD-ROM developers met in the fall of 1985 at the High Sierra Casino and Hotel in Lake Tahoe, Nevada to develop a proposed standard logical format for CD-ROM (Einberger 1987, 41). The results of this effort, known as the High Sierra standard, improved CD-ROM application commonality and formed the basis for ISO Standard 9660. The latter standard allows "any operating system to find any data file on the disc" (Ciuffetti 1991a, 27).

Further discussions of CD-ROM characteristics, standards and compatibility issues are presented in later chapters of this thesis.

### **1. CD-ROM Applications**

Eaton, MacDonald and Saule (1990, 17) state that "optical information technology has been described as a technology in search of an application." This statement



reflects the origins of optical disc technology in projects directed at the home entertainment industry. CD-ROM, for example, is a by-product of CD. The fact that it offers storage of over 600 megabytes of read-only data in a compact, easily mass produced package has not been overlooked by publishers, and according to Eaton, MacDonald and Saule (1989, 5), CD-ROM "has emerged as the leading medium for electronic publishing for material that consists primarily of data with few or no graphics." Nicholls (1991a, 7) asserts that "the number of CD-ROM titles in print continues to grow rapidly, almost doubling each year." As of mid-1991, 1,951 commercially available titles could be identified, with 4,000 titles forecast by mid-1992 (Nicholls 1991a, 7).

CD-ROM applications take advantage of the capability offered by the medium for distribution of large databases on one or more discs. Early CD-ROM products were predominately CD-ROM versions of databases previously available via on-line services or in other machine readable formats (Eaton, MacDonald and Saule 1989, 17). While such applications continue to expand, there is a trend toward creation of new digital databases and conversion of print media to digital. Nicholls (1991a) defined three major categories of CD-ROM products. Index databases provide collections of citations to other data sources. Nicholls (1991a, 9) defines source databases as those containing

"primarily full-text, numeric or textual/numeric data, computer software, images or sounds. . ." He states that reference databases "contain directory-type information, or have the character of reference works, catalogs of non-bibliographic material or a combination of various data types or media" (Nicholls 1991a, 10). Nicholls (1991a) noted a decreasing proportion of index databases relative to source and reference databases which, when combined, represent 79% of all CD-ROM titles.

An additional library CD-ROM application involves production of public access catalogs. For some libraries, CD-ROM catalog databases are a cost effective alternative to online catalogs using central computer resources (Eaton, MacDonald and Saule 1989, 23-24). Catalogs on CD-ROM however, are updated less frequently than online catalogs (Eaton, MacDonald and Saule 1989, 24).

According to Littlejohn (1991, 14), the Federal Government is the largest producer and user of CD-ROM products. Government applications include products of the Census Bureau, the Commerce Department, the Library of Congress, and the Defense Mapping Agency, which produces over 100,000 CD-ROM discs per year (Littlejohn 1991, 14). The military services are also developing CD-ROM products. For example, the Navy's paperless ship program will convert to optical disc storage forty million pages of text and engineering drawings (Littlejohn 1991, 14). In-house

corporate and industrial applications serve similar functions. For example, Nicholls (1989, 116) reports that the entire Boeing 757 parts catalog, encompassing twelve thousand pages of text and six thousand pages of drawings, is published on a single CD-ROM disc.

#### **E. OTHER OPTICAL DISC FORMATS**

Several other optical disc formats have been marketed or introduced, most of which build upon the basic technology of CD-ROM, either overcoming its limitations or expanding its capability. A confusing array of formal and defacto standards, abbreviations and "specifications" has appeared. Most of these developments are aimed at multimedia, a popular industry "buzz-word." According to Nicholls (1991a, 17) "multimedia databases incorporate more than one of the following types of data content: text/numeric, images, and sound." Extensive coverage is devoted to multimedia developments in current computer industry periodicals. Thorough discussion of multimedia technology, initiatives and early application trends is beyond the scope of this thesis. The following general impressions are offered however, based on the author's review of multimedia literature:

- The term multimedia is applied, not only to the databases encompassed by Nicholls' definition, but to any optical disc product that combines two or more of:

text, audio, and video/graphics (still, half motion or full motion).

- In the most advanced multimedia systems, CD-ROM technology is "stretched" to achieve a seamless (from the user's perspective) integration of text, stereo sound, and full-motion video (quality similar to that of television or motion picture) on a single optical disc.
- Several multimedia products employ unique hardware and software solutions, including special processors designed to compress and decompress audio and video data, to overcome the relatively slow data transfer rates associated with the CD-ROM medium. Their associated standards, therefore, are broader in scope than earlier CD-ROM standards.
- Both hardware and software producers envision great potential for multimedia applications in training, education, industry, and entertainment.
- Although some multimedia products have been marketed, multimedia standards and technologies are in their infancy, and the courses of their market development as well as their ultimate impacts within those markets remains undefined.

The following subsections present brief synopses of optical disc formats related to CD-ROM:

**1. Compact Disc - Read Only Memory Extended**

**Architecture (CD-ROM XA)**

Announced in 1988 by Phillips, Microsoft and Sony, CD-ROM XA extends the Yellow Book standard to "applications incorporating text, images, half-speed motion video, and sound" (Nicholls 1991a, 444). CD-ROM XA was introduced "to bridge the gap between the PC world and CD-I" (introduced below) (Herther 1991, 34). Sixteen hours of stereo sound can be combined with EVGA graphics (Cole 1990, 21). Kodak

has introduced Photo CD to the consumer market, allowing storage of ordinary photographic images on optical disc, retrieval by any CD-ROM XA drive and viewing or manipulation on a personal computer (McCabe 1992, 20).

## **2. Compact Disc - Interactive (CD-I)**

CD-I "is a subset of CD-ROM which includes an international set of standards for encoding and integrating audio, video, still pictures, and text" (Bonime 1991, 18). It resulted from a cooperative effort of Phillips, Sony and Matsushita (Norris 1990). Compatible with CD-ROM XA, it is defined by the Green Book standard which, as described by Bonime (1991, 18), "provides specifications for the encoding of text, three levels of audio (in addition to CD-DA audio), several techniques for encoding still images, partial screen full motion video (full screen full motion video will be available later as an upgrade) and the integration of all these in a mouse-based interactive system." CD-I does not employ a personal computer, but rather a dedicated platform incorporating a CD-ROM drive linked to a Motorola 68000 CPU, running a CD Real Time Operating System (CD-RTOS), and connected to a standard television and stereo system (Bonime 1991, 20).

## **3. Digital Video Interactive (DVI)**

Digital Video Interactive is a joint development of IBM, Olivetti, and Microsoft (Norris 1990). Unlike the TV

oriented approach of CD-I, DVI is designed to support full motion video on a personal computer (Norris 1990). It employs a programmable microprocessor for data compression/decompression (McManus 1991, 38). Several hundred multimedia developers are employing DVI technology (Arnett 1991). DVI technology can record seventy two minutes of full motion video on a 650MB CD-ROM disc (Motley 1990, 22). In reality, DVI is not strictly a CD-ROM based concept, as its technology can be applied to hard drives and other types of optical discs (Motley 1990, 22).

#### 4. Multimedia PC (MPC)

A development of Microsoft, the MPC specification is gaining defacto standard status (Arnett 1991). A Multimedia PC Marketing Council has formed, comprised of ten hardware vendors and Microsoft (Barr and Flynn 1991, 38). Over sixty MPC applications have been announced; all designed to operate in the Microsoft Windows environment with Microsoft Multimedia Extensions software (Raskin 1991, 35). MPC is a software based multimedia approach which achieves audio/video integration with acceptable performance in small video windows (less than full screen) (Zelnick 1991, 44). A family of "plug compatible" products is appearing, bearing a distinctive MPC logo, which denotes interoperability similar to that offered by the VHS family of video recording products (Barr and Flynn 1991, 38).

## **5. Compact Disc - Write Once (CD-WO)**

CD-WO is a compact disc technology based on the Orange Book standard developed by a group of companies including Phillips and Sony (Berg 1991, 12). The Orange Book standard defines the physical format of CD-WO discs and characteristics of CD-WO drives (Berg 1991, 12). CD-WO discs are recorded on a one-time basis and can be read by existing CD-ROM drives (Sullivan 1991, 19).

### **III. INTERVIEWS**

#### **A. BACKGROUND**

In order to better understand academic library applications of CD-ROM technology, a series of interviews was conducted. Interviewees were, with two exceptions, librarians with direct responsibility for selecting and implementing CD-ROM products at post-secondary educational institutions of varying size. Selected interview sites provided exposure to several different CD-ROM products and hardware configurations, from stand-alone workstations to local area networks. Two interviews were conducted with systems support technicians; one supporting stand-alone workstations and the other a large CD-ROM network. Given the author's lack of formal library science education and experience, these interviews served to supplement, and provide context to, material found in printed references relating to library CD-ROM applications.

#### **B. INTERVIEWS**

Interviews were conducted at the following sites with the persons indicated:

- University of California, Berkeley; Business and Economics Library: Milton G. Ternberg (Head).



- University of California, Santa Cruz; McHenry Library: Wayne Mullen (Head, Access Services), and Lee D. Jaffe (Microcomputer Specialist and Reference Librarian).
- University of California, Santa Cruz; Science Library: Steven G. Watkins (Assistant Head and Chairman, Database Access Committee).
- University of California, San Diego; Central University Library: Elliot Kanter (Coordinator of Computer Assisted Reference).
- California Polytechnic State University; Kennedy Library: Chi Su Kim (Head, Government Documents), Paul Adalium (Head of Reference), and Mary Lou Brady (Head, Learning Resources and Curriculum Dept.).
- Stanford University; Engineering Library: Steven Gass (Head Librarian and Bibliographer).
- U.S. Naval Academy; Nimitz Library: Ruth M. Hennessy (Reference Librarian and Database Search Coordinator).
- San Jose State University; Clark Library: Altaful Kahn (Instructional Support Technician).
- Monterey Peninsula College; Library: Bernadine C. Abbott (Head of Technical Services).
- Hartnell College; Esta Lee Albright (Public Services Librarian) and Robert Hanrahan (Media Service Supervisor).

### C. INTERVIEW QUESTIONS

An interview worksheet was developed for use at all interview sites except the first (San Jose State). Many of the topics addressed by worksheet questions were discussed at San Jose State, and experience with that interview led to development of the worksheet. The interview worksheet is provided as Appendix A.

#### **D. USE OF INTERVIEW RESULTS**

The primary function of these interviews was to provide the author with current perspectives from library staff members experienced in support of public access CD-ROM databases. Information obtained during interviews and demonstrations of installed systems significantly enhanced the author's comprehension of topics and issues addressed in the literature. Material derived from interviews, including discussion of CD-ROM related policies and practices at interview sites as well as recommendations and opinions of interviewees, are introduced in other chapters of this thesis where pertinent.

#### IV. CD-ROM PRODUCT SURVEY

##### A. REQUIREMENT AND OBJECTIVE

One of the questions posed at the inception of this thesis called for definition of a set of optical disc database products that are candidates for implementation in support of student and faculty research at the Naval Postgraduate School's Dudley Knox Library. As discussed in Chapter II, the domain of available CD-ROM products is growing at an increasing rate. The number of currently available products of potential value to academic library patrons, coupled with a wide variation of product attributes such as cost, licensing provisions, and update frequency, makes selection of products for a given library a complex problem. It is intuitive that product selection should be tailored to the unique needs of the patron population supported by a given library. To achieve that objective for the Dudley Knox Library, a systematic CD-ROM product survey was undertaken, with direct participation by the library staff.

The result sought by this review was a prioritized list of CD-ROM products considered to be implementation candidates by the library staff. The list should reflect priorities based on the potential value added provided by

each product to the library's collections and services relative to the needs of library patrons. Added value was subjectively assessed by participating librarians based on the content, scope and currency of each product's database. In later stages of the review, other factors were considered, such as product strengths and weaknesses documented in reviews in library literature, and interface commonality with other candidate products. Product cost was not considered. As part of an ultimate CD-ROM implementation decision process, issues of affordability or cost effectiveness must be addressed by library management in the context of budget resources and potential tradeoffs involving other library services. The results of this product survey are intended as an input to that process.

#### **B. LIBRARY STAFF PARTICIPANTS**

Library staff participation was recognized at the outset as critical to the ultimate value of a CD-ROM product survey. Library staff members, through the course of their duties, understand the recurring research needs of library patrons. Further, their experience with other research tools, such as printed indexes and on-line database services, provides them with a perspective from which to judge the potential added value of specific CD-ROM products. Early discussions with Knox Library management identified the Reader Services Librarian and Research Reports Librarian

as the library staff members best qualified by experience and position for participation in the CD-ROM product survey. Along with the author, they comprised the product survey team.

## **C. SURVEY OF COMMERCIAL CD-ROM PRODUCTS**

### **1. Domain Definition**

The domain of commercial CD-ROM products to be included in the product survey was initially defined to encompass all products listed in CD-ROMs in Print, 1991 and "Supplement to CD-ROMs in Print", compiled by Desmarais and published in the April, May, June, July/August, and October 1991 editions of CD-ROM Librarian. Although CD-ROMs in Print, 1991 may not provide exhaustive coverage of available products, given the rapid rate of new CD-ROM releases, it was considered adequate when supported by the aforementioned supplements. Other products were identified for consideration based on vendor literature obtained by the author at Online/CD-ROM '91, 10-13 October 1991 in San Francisco.

### **2. Phase 1**

The Reader Services and Research Reports librarians reviewed all product descriptions published in CD-ROMs in Print, 1991 and published "Supplements to CD-ROMs in Print". They were instructed to select for further review any product appearing to have potential value in support of the

Knox library user population. Issues of cost, compatibility, duplication of print resources, etc., were not considered at this point. Any product selected by either librarian was included in the resultant intentionally expansive list of eighty-eight candidates.

### **3. Preliminary CD-ROM Collection Development Policies**

Prior to narrowing the list of candidate CD-ROM products, the product survey team met to discuss CD-ROM selection criteria. Issues identified through review of available literature addressing CD-ROM collection development were discussed. Opinions and choices expressed by the Reader Services and Research Reports librarians formed the basis for a set of preliminary CD-ROM collection development policies tailored to the needs of the Dudley Knox Library. A later section of this chapter addresses this process in greater detail.

### **4. Phase 2**

During the second phase of the CD-ROM product survey, the Reader Services and Research Reports librarians were instructed to independently review the product list produced in Phase 1, classifying each product on that list into one of the following categories:

- Category A: Strong potential value to the library.
- Category B: Of moderate value to the library.
- Category C: Of uncertain value to the library.

- Category D: "Nice to have", but of lesser value/priority.

Product classification was based on database content and coverage. Cost was not a factor considered. Products of duplicate content and coverage (same database, but different vendors; or different databases with similar scope and coverage) were included together within the same category. If a librarian was unable to determine the relative value of a product with the information available, it was placed in the "uncertain" category. Any product categorized differently by the two librarians was placed in the higher of the two involved categories. This phase resulted in a Category A product list with thirty-eight entries. Sixteen products were assigned to each of Categories B and D and five products were assigned to Category C.

### 5. Phase 3

The survey team subjectively determined that Category A encompassed a greater number of products (38) than the library could reasonably expect to support. Products in Categories B through D were therefore eliminated from further evaluation. The librarians were instructed to independently review the Category A list, classifying each product as either "high" or "low" (in terms of potential added value) within that category. Any product receiving at

least one "high" evaluation was included in the "high" sub-category, which ultimately encompassed twenty-three products (nine databases in the Jane's series were grouped as one).

#### **6. Phase 4**

The survey team librarians were instructed to prioritize the products on the list produced in Phase 3. A collection of publishers' product literature and published product reviews from the library literature was provided to the librarians. A "Candidate Commercial Products List" was created from the results of this phase for use by Dudley Knox library management. A copy is included as Appendix B.

#### **D. SURVEY OF U.S. GOVERNMENT CD-ROM PRODUCTS**

##### **1. Domain Definition**

Domain definition for a survey of U.S. Government CD-ROM products is complicated by lack of a comprehensive and convenient source document of the type represented by CD-ROMS in Print, 1991. Although many Government CD-ROMS are distributed through the Government Printing Office (GPO), no GPO-produced comprehensive and separate listing of Government CD-ROM products was found. Two documents providing descriptions of U.S. Government CD-ROM products were located:

- USGS Library/SIGCAT CD-ROM Compendium. This is a directory of product information describing CD-ROM discs published by commercial firms and Government agencies. All products listed distribute Government data. The



Compendium is maintained and distributed by the U.S. Geological Survey (USGS) Library in Reston, Virginia and the Special Interest Group on CD-ROM Applications and Technology (SIGCAT), a user group sponsored by USGS. Some entries describe commercially published products also listed in CD-ROMS in Print, 1991.

- The Directory of U.S. Marine CD-ROMs. This directory was produced by the U.S. Department of Commerce, National Oceanographic and Atmospheric Administration Central Library. It contains descriptions of CD-ROM products containing marine/oceanic information, produced by Government agencies, academic institutions and private firms.

While the above listings together do not ensure exhaustive coverage of U.S. Government CD-ROM products, they provide the best collections of product information in convenient format known to the author.

## 2. Product Survey

The librarian members of the same survey team formed to review commercial CD-ROM databases participated in this review. Each was asked to: review the products cited in the preceding section, select those of potential value to Knox library patrons, and segregate them into the same categories (A-D) used in connection with the commercial products. A total of seven products (not already identified in the commercial products survey) were selected and categorized. The Reader Services Librarian indicated that a few databases not selected as candidates for library

implementation may be appropriate for local implementation by the Meteorology or Oceanography Departments.

Appendix C provides the "Candidate U.S. Government Databases" list resulting from this phase of the survey. Because of the relatively low number of products involved, the categorization alone was considered adequate prioritization of the products for purposes of this survey.

#### **E. CD-ROM COLLECTION DEVELOPMENT POLICY**

In order to provide a general framework for product review decisions regarding CD-ROM selection and prioritization, a draft CD-ROM Collection Development Policy was produced. This section describes the development of that policy and presents a brief discussion of related collection development topics.

##### **1. CD-ROM Collection Development at Other Libraries**

Review of the library literature indicates that most libraries embraced CD-ROM products before developing any formal collection development guidelines. Of seventy three libraries responding to a 1990 survey by the Association of Research Libraries (ARL), only eighteen had formal collection development policies (Clark 1990, 2). Example policies from that group are published in ARL Spec Kit 169 (ARL 1990). According to Clark:

A variety of selection arrangements are used including selection committees, section/division heads, all staff, and subject bibliographers. Challenges to selection

include not only evaluating the quality of the database, but also of the retrieval software. Selection decisions are often coordinated with reference personnel who will have to provide reference assistance, instruction, and documentation for the project. (Clark 1990, 2)

None of librarians interviewed by the author in connection with this thesis selected CD-ROM products on the basis of a formal collection development policy.

## **2. Collection Development Aids**

A number of checklists have appeared in the literature for use by librarians evaluating CD-ROM products. Many of them are very detailed in their coverage of product characteristics and, in the author's opinion, would best be applied when a trial copy of the product under consideration is on hand. Elshami (1990, 117-19) provides an example which includes a separate set of criteria for evaluating full text databases. Nicholls (1991a, 47-52) presents a very comprehensive checklist, as well as a bibliography of collection development literature. He notes that "detailed checklists are useful in gathering and organizing data to support (and justify) purchase decisions; however the list of crucially important bottom line criteria is likely to be much shorter" and provides two checklists of ten or fewer criteria authored by King and Paisley (Nicholls 1991a, 55).

## **3. Creating a Draft Collection Development Policy**

In the author's opinion, the checklists discussed above are too detailed (with the possible exception of

King's) for effective application in a survey designed to narrow a domain of available CD-ROM products from hundreds down to a more manageable list of twenty-five to thirty. A broader set of criteria was required. Since the criteria applied to the development of a list of candidate CD-ROM products should logically reflect the informational needs of library patrons and the judgment of librarians responsible for meeting those needs, it seemed equally logical that a statement of those criteria should be drafted early in the review process and form the basis of a Collection Development Policy. To achieve that objective, a list of CD-ROM collection development considerations and alternatives was developed by the author through review of other libraries' policies (ARL 1990) and an unpublished report by Nicholls based on the ARL survey (Nicholls 1991b). This list was reviewed with the librarian members of the product survey team. Their opinions and decisions were recorded and reflected by the author in a draft CD-ROM Collection Development Policy (Appendix D).

#### **F. FOLLOW-ON ACTIVITIES**

The product lists resulting from the survey described above represent an initial step in CD-ROM collection development for the Knox Library and are intended to provide input to a follow-on evaluation process. This process should include consideration of cost versus benefit and more

detailed evaluation of individual product features. None of the products reviewed was examined in detail through trial implementation or demonstration. On-site trial product evaluations and application of more detailed checklists similar to those mentioned above are appropriate steps for a follow-on review.

## V. WORKSTATION TRIAL

### A. BACKGROUND

In order to study the potential impact of CD-ROM implementation in the Dudley Knox Library setting, a single public access CD-ROM workstation was placed in the library's reference section. *Computer Select*, a computer periodicals and product information database published on CD-ROM, was chosen for trial implementation. Prior to installation of this workstation, no CD-ROM databases were available in the library for direct patron access. Two CD-ROM databases were in use by library staff members. *Books in Print Plus* was available to the Acquisitions Department staff and the Defense Technical Information Center (DTIC) reference database was in use by Research Reports staff members in support of student research.

The Dudley Knox Library supports, almost exclusively, masters and doctorate level graduate students and faculty in curricula designed to meet Navy and Department of Defense requirements. The student population is composed of mid-grade U.S. and foreign military officers and Department of Defense civilian employees. It was hypothesized that a majority of students have some experience using personal computers, either in the course of previous duty assignments

or in connection with academic programs. Personal computers are accessible to all students at campus PC laboratories.

The experience of other libraries with CD-ROM databases, well documented in library journals, helps significantly in defining potential CD-ROM implementation issues (addressed in Chapter VI). Implementation of *Computer Select* provided an opportunity to supplement literature reviews with direct public access CD-ROM experience in the unique environment of the Dudley Knox Library.

## **B. DESCRIPTION**

### **1. Hardware**

The CD-ROM workstation consisted of an IBM compatible UNISYS 80386-based personal computer, a single UNISYS CD-ROM drive, and user reference material. It was located on a separate table adjacent to the Reference Librarian desk. The workstation was equipped with both 3.5 inch and 5.25 inch floppy disk drives, enabling users to download and retain data. A Video Graphics Adapter (VGA) monitor was included. No printer was provided.

### **2. CD-ROM Product**

*Computer Select*, a computer periodical and product database published and distributed by Ziff Communications Company, was selected for trial implementation. *Computer Select* includes the following sections on a single CD-ROM disc (Lotus 1991):

- **Articles From Computer Periodicals:** full text of over 40 computer related periodicals and abstract citations from over 110 more.
- **Hardware Product Specifications:** coverage of over 28,000 computer hardware products.
- **Software Product Specifications:** coverage of over 38,000 computer software products.
- **Computer Industry Company Profiles:** data on size, sales volume, key personnel, addresses/phone numbers, etc., for over 11,000 companies.
- **Glossary of Computer Terms.**
- **User's Guide for *Computer Select*:** online version of printed User's Guide.

*Computer Select* is updated monthly via a CD-ROM disc containing periodical articles and abstracts published within the most recent 12 months.

Lotus *BlueFish* retrieval software is provided on each *Computer Select* CD-ROM disc. The *BlueFish* user interface is menu driven, with accelerator key options provided to increase speed of operation for experienced users. Word or field searches may be employed to retrieve data from *Computer Select* database sections. Multiple fields can be specified as criteria for a single search, effectively limiting search scope. Similarly, word searches may employ boolean operators and proximity limiters to explicitly define or refine a search. Retrieved documents may be individually browsed on the workstation monitor and selectively marked for subsequent download. Nicholls



(1991a) reviews *Computer Select*, rating it "excellent" for search power and ease of use.

### 3. User References

No scheduled user training was offered. User references maintained at the workstation were developed by the author or selected from documentation provided with *Computer Select* by the publisher. These references provided completed instructions for use of the *Computer Select* user interface, including development of search strategies. Additionally, instructions were supplied by the author detailing hardware dependent functions, such as procedures to download *Computer Select* search results via installed floppy disk drives. User references were intended to provide adequate support of searches by first time or experienced users. The following material was maintained at the workstation:

- *Computer Select User's Manual*. This is a compact, yet comprehensive reference supplied by the publisher.
- Placard: "*Typical Computer Select Sequence*". A laminated single page quick reference guide affixed to the workstation table surface (sample provided in Appendix E).
- "*Computer Select Quick Reference*": A quick reference guide supplied by the publisher.
- "*Computer Select Quick Reference Notebook*": A loose leaf binder containing the following individual quick reference guides developed by the author: "*Sample Search Strategies*"; "*Importing Computer Select Files into WordPerfect 5.1*"; and "*Instructions for Downloading Search Results*" (samples provided in Appendix F).

### **C. STAFF TRAINING**

During a two day period, all Dudley Knox Library staff members regularly or periodically assigned to assist patrons at the reference desk received indoctrination covering the features and operation of the *Computer Select* workstation. Indoctrination consisted of a detailed demonstration at the workstation, including familiarization with the user references. Appendix G provides the Indoctrination Checklist employed for staff training. During the three subsequent work days, the workstation was available exclusively to library staff members for ad hoc practice sessions. Upon completion of this period, the workstation was opened for public access. Staff training was conducted during a break in the school's academic schedule between quarter final examinations and commencement of the next quarter, assuring minimal interference with patron services.

### **D. PUBLICITY**

Prominent signs at the workstation identify it to library patrons and summarize the features of *Computer Select*. A front page article describing the workstation and *Computer Select* was published in the Naval Postgraduate School's weekly newsletter. The newsletter is widely distributed on campus. Additionally, the "Computer and Information Services Bulletin", published on campus by the

Dean of Computer and Information Services, included a brief descriptive article.

#### **E. TRIAL OBJECTIVES**

The trial implementation of *Computer Select* supported several objectives. Primary among them was observation of the impact of a public access CD-ROM database in the specific setting of the Dudley Knox Library. In addition, it provided an opportunity to develop first hand Reader Services (reference) staff experience with support of a public access CD-ROM product.

Specific questions investigated through *Computer Select* implementation included:

- Can Dudley Knox Library patrons successfully teach themselves to use a sophisticated CD-ROM product without formal training sessions or extensive librarian involvement?
- How will CD-ROM databases be accepted by library patrons? Will usage grow significantly over time?
- What general or specific CD-ROM implementation issues will arise in the Dudley Knox Library environment?.
- Can the Dudley Knox Library Reader Services staff adequately assist CD-ROM users with search planning or user interface procedures given only an initial demonstration/indoctrination and access to product user documentation?
- Given a full-text database product; will floppy disk download facilities, without printer support, satisfy user needs?

A secondary, but significant, objective was avoidance of unnecessary Reader Services staff workload increases related to record keeping, development of user reference material, or workstation maintenance. This objective impacted design of User Log sheets and mitigated against attachment of a printer to the workstation.

#### **F. DATA COLLECTION**

This section describes the methodology employed for collection of *Computer Select* usage data.

##### **1. Trial Period**

The *Computer Select* trial took place over one academic quarter from 04 October to 18 December 1991. Collection of user data continued after 18 December to allow monitoring of workstation usage rates at the discretion of the library staff, however that data was not included in thesis analysis.

##### **2. User Log**

A "*Computer Select* User Log" was developed and placed on a clipboard located at the workstation. A sample is provided as Appendix H. The following data was collected from each *Computer Select* user:

- Curriculum Number or Department (Each student user provided a three digit number identifying his/her academic curriculum. Faculty or staff users provided a department or office code. Visitors entered "other".

- Start Time and Finish Time (From these two figures, session duration was computed).
- Assisted by librarian (Yes/No).
- Search considered successful (Yes/No).
- Did you download to disc? (Yes/No).
- First time user? (Yes/No).

Space was provided at the bottom of the User Log for comments and recommendations.

### 3. Database

User log data was accumulated in a microcomputer database to enhance ease of data analysis.

### G. ANALYSIS

Table 1 provides statistics derived from User Log data. Students from twenty-six Naval Postgraduate School curricula used the *Computer Select* workstation during the trial period. Twenty-seven sessions were logged by faculty or staff members, and users of ten sessions identified themselves as "other". Users in the latter category could include students from other academic institutions.

Few recommendations for improvement of the workstation were received from users in the space allocated on the User Log. Ten users offered comments, with the most frequent

**TABLE 1. COMPUTER SELECT USAGE**

<b>Description</b>	<b>No.</b>	<b>%</b>
<b>Total documented user sessions</b>	216	100
<b>Sessions involving first time users</b>	106	49.1
<b>Sessions involving repeat users</b>	110	50.9
<b>Session length (minutes)</b>		
<b>Average overall</b>	22	
<b>Average first time user</b>	22	
<b>Average repeat user</b>	21	
<b>Shortest</b>	1	
<b>Longest</b>	135	
<b>Sessions involving librarian assistance</b>	9	4.2
<b>First time users assisted (Note 1)</b>	5	4.7
<b>Repeat users assisted (Note 2)</b>	4	3.6
<b>Sessions with "successful" search results</b>	164	75.9
<b>First time users "successful" (Note 1)</b>	70	66.0
<b>Repeat users "successful" (Note 2)</b>	94	85.5
<b>Sessions involving downloading to floppy disk</b>		
<b>Percent of "successful" sessions</b>	87	40.3
<b>First time users downloading (Note 1)</b>	33	31.1
<b>Repeat users downloading (Note 2)</b>	54	49.1
<b>Number of daily users</b>		
<b>Average</b>	3.1	
<b>Maximum</b>	13	
<b>Notes: 1. Percentage based on number of first time users.</b>		
<b>2. Percentage based on number of repeat users.</b>		

inputs expressing strong support for the workstation (4) and requesting increased coverage of periodicals or time span (4). Only two users suggested addition of a printer to the workstation. Even though the *Computer Select* database is updated monthly, one user was dissatisfied with its currency. One suggested an improvement to the *Bluefish* software's downloading procedure.

Verbal user feedback received by the author during the trial was uniformly positive. Several users indicated that *Computer Select* had significantly eased, enhanced or expedited research for class projects or thesis work.

#### H. DISCUSSION

The *Computer Select* workstation proved to be a positive addition to the scope of Dudley Knox Library services at minimal cost in terms of staff workload. User acceptance, as discussed above and as reflected in the number of initial and repeat users, appears to be high.

Clearly, the Dudley Knox Library patrons constituting the user group for *Computer Select* were able to teach themselves to adequately use this CD-ROM reference database with little or no library staff assistance. The 4.7 percent

assistance rate for first time users was significantly less than anticipated based on review of the library literature relating to CD-ROM instruction. It is the author's opinion however, that this result does not serve as an entirely adequate predictor of assistance demands that may be generated by CD-ROM products targeting a different segment or larger proportion of the library's patron population. In the author's opinion, the *Bluefish* software's user interface is among the easiest to learn and use of the several CD-ROM product interfaces to which the author has been exposed. Further, the predominate users of *Computer Select* are students in computer and engineering curricula, who may have greater than average experience with use of both personal computers and application documentation. Nonetheless, while there may be other factors contributing to the exceptionally minimal user assistance demand experienced, the results tend to corroborate Pavelsek's (1991) suggestion of a link between computer skills of a user population and demand for user instruction/assistance.

The method of data collection is a possible factor impacting the low recorded incidence of requests for staff assistance. Requiring users to document in the User's Log



their inability to use the workstation unassisted, even though no personal identifying data was recorded, may have deterred some questions. This method of data collection was chosen to minimize staff record keeping requirements.

Demand for user assistance by staff members may be greater in connection with a different CD-ROM database appealing to users enrolled in less technical curricula. If, as hypothesized, most Naval Postgraduate School students have some personal computer experience, the difference in demand compared to that experienced in connection with *Computer Select* may not be large, but no prediction can be offered based only upon the *Computer Select* trial.

The low level of user demand for staff assistance precluded assessment of the Reader Services staff's ability to adequately assist CD-ROM users with search planning or user interface procedures given only an initial demonstration/indoctrination and access to product user documentation.

The absence of a printer at the *Computer Select* workstation apparently did not significantly degrade its ability to satisfy user needs in the Dudley Knox Library setting. Also, without a printer installed, the Reader

Services staff was relieved of any requirement to supply it with paper, ribbons or maintenance support, and no noise level increase was incurred. As mentioned, only two users suggested addition of a printer to the workstation. It should be noted however, that 47 percent of users who considered their searches successful did not download the results to a floppy disk.

In summary, the impact of the *Computer Select* CD-ROM workstation on library staff workload was negligible. User acceptance was considered excellent. Dudley Knox Library patrons, with few exceptions, independently learned to use *Computer Select*. Restricting workstation output to downloading was an acceptable single output method for Knox library patrons using the full text *Computer Select* database.

## **VI. IMPLEMENTATION ISSUES**

When considering or executing implementation of public access optical disc products, several issues warrant special attention. Those discussed in this chapter were selected based on review of current literature and interviews with academic librarians experienced with public access optical disc installations (see Chapter III). Library personnel responsible for selecting, purchasing, implementing, or supporting optical disc assets should understand these issues and their implications. The discussions presented in this chapter are intended to be informative rather than exhaustive. Review of the cited references will provide more detailed coverage.

### **A. License Agreements**

Use of CD-ROM products acquired by libraries from most publishers is governed by license agreements detailing rights granted to the library for use of the discs, search/retrieval software, and the information provided by the product (Jensen 1991, 13). Among other things, these agreements may specify restrictions on use of the information, responsibilities assumed by the library as a condition of use, and provisions for disposition of discs

upon termination of the agreement (Jensen 1991, 12-14). The use of license agreements departs from the traditional methods employed by librarians when procuring print additions to the library's collection (Jensen 1991, 14). Books and other materials purchased under conditions of "sale", once acquired, become the property of the library. Such materials may be retained indefinitely, resold, or otherwise disposed of at the discretion of library management (Jensen 1991, 14). Their use is governed by copyright law, including the doctrine commonly referred to as "fair use". CD-ROM licensing agreements, on the other hand, rely upon contract law to protect the rights of the owner of the contained information (Shaiman and Rein 1989, 29). Under these agreements, the library (licensee) does not own the product, but is granted only those rights to its use specified within the license and pursuant to its terms and conditions (Jensen 1991, 13). It should be noted however, that use of a license agreement does not deprive a CD-ROM publisher of the rights afforded by the Copyright Act (Jensen 1991, 15).

#### **1. The Logic Behind Licenses**

The machine readable mass storage capability of CD-ROM technology provides an end-user with the means to easily copy (via printing or downloading) large quantities of data. CD-ROM publishers are concerned with the potential for this

capability to facilitate violation of rights traditionally protected by the Copyright Act. Nissley summarizes this concern as follows:

This new era of electronic publishing, with its rapid pace of product development and changing technology, has made publishers in the information industry prone to paranoia. It is the fear of original information being manipulated electronically, republished and offered commercially in a competitive fashion, without compensation to the copyright holder, which provides the impetus for restrictive licensing agreements. (Nissley 1990, 6)

As applied to optical disc products, the utility of copyright law has been eroded by advancing technology (Dobb 1990, 19). Dobb contends that ". . . the law of copyright as applied to newer forms of information transfer is still being created on a case-by-case basis" and that information professionals "must exercise some degree of independent judgement" in attempting to meet the intent of copyright law with respect to the rights of information providers (Dobb 1990, 19-20). She further states that "at the very least, one's professional judgment should be shaped by a regard for 'fair use'" (Dobb 1990, 20).

Shaiman and Rein (1989) provide a synopsis of the fair use concept contained in Section 107 of the Copyright Act, in the context of its application to CD-ROM. They summarize the provisions of Section 107 as follows:

Section 107 focuses on fair use. It codifies years of prior judge (sic) made law (common law or precedent as you prefer). To paraphrase, it says that the fair use of a copyrighted work for purposes of teaching, scholarship or research is not an infringement. It

lists four factors for consideration. 1) Whether such use is of a commercial nature or for non-profit educational purposes; 2) The nature of the work (e.g. fact or fiction); 3) The amount used in relation to the whole; and 4) The effect upon the potential market or value of the work. (Shaiman and Rein 1989, 28-29)

Noting that some principles have been established for "fair use" of video recordings and computer programs, Dobb observes:

For CD-ROM, however, the limits of copyright or fair use of materials have not been tested. Restraints, except by analogy to other media, have yet to be established. Indeed, the issues themselves have yet to be defined. (Dobb 1990, 20)

Section 106 of the Copyright Law defines the rights of copyright owners. Section 108 limits the rights of librarians under Section 106 (Shaiman and Rein 1989, 29). The utility of this section in instances dealing with new technology is also hindered by lack of recent application in case law (Shaiman and Rein 1989, 20).

License agreements thus serve to counter the uncertainties of copyright law, supplying "answers, rules, limits, and boundaries which are now nearly nonexistent in the current legislation or cases existing today in this area of the law" (Shaiman and Rein 1989, 30). Additional control over dissemination of information on CD-ROMs is afforded by license provisions granting use of the product for a finite time period, often with mandatory return of discs if the agreement is not renewed (Pooley 1990, 33). The net effect of licensing can minimize the risk of lost revenue for

information providers and has been a key factor supporting decisions to make information available in the CD-ROM format (Pooley 1990, 34).

## **2. Common Provisions of CD-ROM License Agreements**

A CD-ROM license agreement is a contract between the CD-ROM publisher and subscriber. Jensen (1991) notes that ". . . if a user agrees to contract terms that place more limits on the use of a CD-ROM product than those imposed by the Copyright Act, those contractual limits are enforceable". Examples of provisions addressed by agreements are presented below. It should be remembered however, that each publisher is free to include provisions considered necessary to protect his/her interests and the contents of license agreements will vary accordingly.

### ***a. Printing and Downloading***

Printing and downloading are considered forms of copying (Jensen 1991, 15). As mentioned above, printing and downloading issues provided much of the impetus for development of CD-ROM license agreements. Printing restrictions may address limits on photocopies of printouts (Duggan 1991, p. 23). The focus of downloading restrictions will often be prevention of data use for commercial purposes. Some license agreements limit downloading to creation of temporary files from a portion of the database for research purposes (Duggan 1991, 23). Others

(Silverplatter Information, Inc. for example) stipulate that downloaded information can only be used internally to the subscribing organization and it may not be used in the creation of other database products for sale (Pooley 1990, 38). Jensen (1991, 15) found examples which rely upon the limitations of the Copyright Act or "say nothing about downloading and copying, which is the same as allowing whatever the Copyright Act permits". As previously addressed, a librarian must use professional judgment in such cases when setting printing or downloading policies consistent with fair use. Shaiman and Rein (1989) suggest guidelines.

*b. Networking*

Jensen (1991, 15) found that local area network (LAN) provisions of CD-ROM license agreements fall into four categories:

- Network use permitted at no additional charge.
- Network use permitted upon payment of additional fees.
- Network use prohibited.
- No mention of networking (equivalent to prohibition).

Remote access (via modem) is often prohibited outright and when allowed, both remote access and wide area networking (WAN) require specific permission (usually accompanied by a fee increase) (Jensen 1991, 15-16).



Networking provisions of license agreements may set limits on the number of simultaneous (or concurrent) users allowed to access a CD-ROM. Perusal of pricing schemes from various publishers reveals that subscription fees may also be determined based on the number of simultaneous users. The manner in which "simultaneous user" is defined is very important. The network operating system software in use may provide for establishment of a limit to the number of workstations allowed to simultaneously access a given application (American Library Association 1991a, 48). While this measure will effectively limit the number of simultaneous users, it may not satisfy license requirements from the perspective of a publisher who counts simultaneous users based on the total number of workstations connected to the network or the number the network itself is licensed to support. If a software solution is not possible or not acceptable, it may be necessary to negotiate a realistic limit (American Library Association 1991a, p. 48). The American Library Association (ALA) offers the following advice:

The definition of the number of "simultaneous" or "concurrent" users should be agreed to in writing and, if it is to be based on the library's representations, it should be agreed that the representation, once accepted, should be binding for at least three years. (American Library Association 1991b, p.58)

***c. Control of Discs and Software***

Most CD-ROM license agreements require return or destruction of superseded discs upon receipt of updates, allow creation of only one back-up copy of retrieval software, and prohibit resale of discs to third parties (Jensen 1991, 14).

***d. Price Stability***

Noting the volatility of CD-ROM pricing schemes, the ALA suggests inclusion of a contract clause capping price increases, stating:

Many vendors will accept an escalator clause which ties price increases to the Consumer Price Index or to a specified annual percentage--typically 5 to 8 percent. The absence of such a clause makes a library vulnerable to dramatic price increases which reflect changes in vendor pricing strategies, rather than increases in costs. (American Library Association 1991a, 48)

***e. Monitoring Usage***

A license agreement may require the library to enforce usage restrictions, including limitations on copying (downloading or printing) (Nissley 1990, 8). The posting of warnings detailing restrictions on copying is expected (Nissley 1990, 8). Goldstein (1990, 49) offered an opinion that, in addition to posted warnings, provision of security for the CD-ROM discs and awareness of unusually long user sessions constitute adequate control.

License agreements may require that the subscriber confine access to the product to a specific group

of people (employees, etc.) (Jensen 1991, 16). Jensen (1991, 16) recommends that "subscribers who intend to use a CD-ROM in a public setting such as a library should always notify the producer of their intended use in their order so that the producer cannot later claim that the subscriber violated a confidentiality clause by making the product available to the public."

It seems apparent that any license agreement provision requiring the subscriber to control use should be carefully reviewed for feasibility in the intended setting.

#### *f. Applicable Law*

A license agreement may specify that the agreement will be governed by the state in which the publisher is located. Most publishers will agree to modify this provision upon request to reflect the subscriber's state (Nissely 1990, 9).

### **3. Negotiating License Agreements**

An American Library Association newsletter recently stated that ". . . electronic publishing remains an immature industry in which many vendors and customers alike are still feeling their way" (American Library Association 1991b, p. 57). Many examples in library literature cite instances in which unacceptable license agreement provisions have proved negotiable. A common theme stresses the importance of careful review of all terms of an agreement. Some

librarians have obtained advice or assistance from purchasing departments or campus attorneys (Duggan 1991, 22). Jensen (1991, 16) observes that license terms constitute an offer from a publisher and subscribers "have the right to make a counter offer containing the terms under which they are willing to acquire the CD-ROM product."

## **B. CD-ROM PRICES**

CD-ROM subscription prices have been perceived as too high, and reducing them has been a greater priority among librarians than other issues such as CD-ROM networking and standardization of search software (Neame 1989, 94). Fortunately, some success has been realized. Pricing schemes and trends will be addressed below.

### **1. CD-ROM Pricing Schemes**

CD-ROM pricing schemes have been in a "state of flux" as publishers "gain experience and begin to come to grips with the economics of the new medium" (Nicholls 1991a, 27). Some products are priced low to attract market share while others are priced high to offset development costs and hedge against potential lost revenue from print or online versions of the same database (Nicholls 1991a, 27). Arnold (1989, 10) also cites publisher's uncertainty over impact on other media and their difficulty in determining how to price information.

Price structures in use today by CD-ROM publishers employ a variety of strategies and criteria. Price and licensing strategies are closely related (Nicholls 1991a, 27). The price of a subscription may depend upon such factors as:

- Network access.
- Maintenance of concurrent subscriptions to print versions (if applicable).
- Remote access via modem.
- Update frequency.
- Purchase of optional back-file discs.

One Canadian CD-ROM publisher defends CD-ROM prices, citing the "rolling cumulation" feature of CD-ROM (each update can retain existing data and add more), the fact that many CD-ROMs are updated quarterly as opposed to the annual updates of print versions, and the powerful search features offered by CD-ROM software (Neame 1989, 95). One respondent to a survey of Canadian Library Association CD-ROM Interest Group members conducted by Neame (1989, 95) partially countered that logic, asserting that libraries should not have to pay repeatedly for retrospective data that is merely retained with each disc update.

## **2. Price Trends**

According to data collected by Nicholls, average CD-ROM prices have been declining for the last four years,

although CD-ROM index and sources database prices are relatively stable, and reference and directory prices have increased (Nicholls 1991a, 27). The average price of a CD-ROM database in 1991 was \$702 (Nicholls 1991a, 19). Three factors are driving down CD-ROM prices (Arnold 1989, 7):

- Decline in CD-ROM production cost.
- Decline in CD-ROM drive prices.
- Competition among publishers.

Nicholls (1991a, 20) contends that continued decline of CD-ROM prices, coupled with more liberal licensing and networking policies, will make CD-ROM an increasingly attractive asset to libraries.

#### C. COST EFFECTIVENESS OF CD-ROM

Closely related to CD-ROM price structures is the issue of cost effectiveness. CD-ROM implementation and support will involve a continuing investment of library assets, possibly requiring trade-offs in funding or support of other services. Although fixed and recurring monetary costs for a given hardware and CD-ROM product suite can be tabulated or estimated, many of the benefits realized through CD-ROM services are difficult to quantify. For example, Ternberg (1991) received specific feedback from professors at the University of California, Berkeley noting improvements in quality of student project research and bibliographies,

believed attributable to CD-ROM use. Also, the potential costs in terms of impact on other library services, whether significant or not, are logically site dependent. Library size, supported curricula and population, staffing level and overall budget posture are all pertinent variables when assessing CD-ROM cost effectiveness in the broader context of a total library program. However, literature addressing the experience of libraries with installed CD-ROM services, augmented by impressions gained through librarian interviews conducted for this thesis, reveals some common trends. This section will draw upon those sources to discuss justification of CD-ROM investment and other cost effectiveness issues.

#### **1. CD-ROM Cost Justification**

A survey of Canadian Libraries conducted by Fox indicated that service rather than cost savings was the predominate motive for CD-ROM implementation (Neame 1989, 94). This finding closely parallels the comments of eleven librarians interviewed by the author in connection with this thesis at eight post-secondary institutions. When asked: "How is the cost of CD-ROM justified?"; none of the interviewees indicated that a formal review process or cost-benefit analysis had been conducted. The following factors were among those cited:

- Better service efficiency.

- More direct, improved access of information for end-users.
- Service enhancement--not a substitute.
- Enables more complex, efficient end-user searching.
- CD-ROM capabilities not matched by paper sources.
- Higher usage levels than print counterparts.
- Lower threshold for access to data (easier for the end-user to obtain it).
- More democratic way to deliver a source of information--online services too expensive for many users.
- People are drawn to computers.
- If networked, resources are multi-user vice single user.
- Many years of data searched at the same time as opposed to separate volumes of print indexes.
- Users can develop bibliographies while searching.
- Users can search through many avenues and directions--they gain the capability to explore.
- CD-ROM is fixed cost versus time based cost of online searching.
- Lower cost per search than online searching.

As reflected above, discussion of CD-ROM cost effectiveness often evokes comparisons with print and online resources, many of which are direct counterparts of CD-ROM products. Foulds and Foulds (1990, 34) state that printed versions "accumulate rather than cumulate . . ." and CD-ROM "once mastered . . . can be considered more user-friendly than hard copy, providing many more access points to the information and much more powerful searching."



Online search costs vary depending the database(s) accessed and time spent searching, and have steadily risen since the medium was introduced (Nicholls 1991a, 21). Online services are less user friendly than CD-ROM and browsing is uncommon (Foulds and Foulds 1990, 34). CD-ROM costs are often viewed as fixed (determined primarily by the cost of the hardware and database) and have been declining (Nicholls 1991a, 21). The notion that CD-ROM costs are all fixed is not however, completely accurate. There are recurring variable costs associated with printer paper, printer ink cartridges or ribbons, workstation maintenance, training etc.

Given the fixed nature of predominate CD-ROM costs (hardware and subscriptions), the cost per CD-ROM search decreases with increased usage, while no such benefit accrues from increasing the number of online searches (Foulds and Foulds 1990, 34). Hence, Foulds and Foulds (1990, 34) recommend aggressive promotion of established CD-ROM services to achieve increased cost effectiveness.

Nicholls offered the following observation regarding online and CD-ROM services:

In most cases, the only real advantage that online has is currency. It makes perfect sense to lease or buy retrospective data on the more economical medium, then willingly pay through the nose when necessary for the most current data available through the expensive online medium. (Nicholls 1991a, 24-25)

Introduction of CD-ROM databases frequently affects the monetary costs incurred by a library in support of other services. Demand for online searches may decrease, reducing access costs commensurately. Interlibrary loan costs often increase with implementation of bibliographic databases as CD-ROM end-users take advantage of powerful search capabilities of CD-ROM, quickly and easily producing lists of source citations not limited to an involved library's holdings. These factors will be discussed in greater depth in subsequent sections of this chapter.

Foulds and Foulds (1990, 33) offer the following generalization with respect to CD-ROM cost effectiveness: "CD-ROM used in a library may produce better and more expansive reference services than any other technology can achieve for the same cost."

#### **D. USER AND STAFF INSTRUCTION**

Introduction of public access CD-ROM databases in a library presents questions and challenges for librarians with respect to user and staff training requirements. A number of recent articles in library and CD-ROM industry literature have focused on CD-ROM instruction issues, often relating experience gained by early implementers of library CD-ROM products. Dunning (1989, 209) states that "a major advantage of off-line databases [CD-ROM databases are off-line] is an end-user's immediate feeling of being in control

of a search without a library specialist needing to hover nearby." While this may be a correct statement, many libraries have experienced a requirement for significant librarian involvement in search assistance and end-user training. Citing a survey of thirty eight Association of College and Research Libraries (ACRL) members with CD-ROM instruction experience, Whitaker (1990, 32) notes that "although CD-ROMs have cut down on requests for mediated online searches, it has resulted in busier reference desks . . ." Similarly, Bostian and Robbins (1990, 14) found that "despite publishers claims to the contrary . . . students required some instruction before they could successfully search the CD-ROM databases." While Broughton, Herrling and McClements (1991, 17) assert that convincing students that they need instruction to effectively use CD-ROM products is a common problem for librarians, Harrington (1990, 14) found that of 129 University of Charleston students who received an orientation class on CD-ROM, 89 percent indicated a desire for "some form of CD-ROM training" when surveyed a semester later. On the other hand, Pavelsek (1991) cites increasing computer literacy among users and the experience of New York University with CD-ROM instruction in advocating that printed "hand-outs" alone are sufficient. Eaton, MacDonald and Saule (1989, 60) state that "searchers tend to resist instruction requirements and often tend to get training or help only if they absolutely need it and only at

the point that they need it." They later assert that "once patrons receive some form of instruction, contact with trained searchers by librarians will be minimal" (Eaton, MacDonald and Saule 1989, 61).

A 1987 study at Cornell University's Mann Library tested the performance of 100 students in searching the CD-ROM and print versions of ERIC (a popular bibliographic index in the education field) with and without formal instruction. The results are summarized as follows:

The investigators discovered that those students searching the CD-ROM ERIC, whether trained in searching or not, found more relevant citations in less time than those searching the printed version of ERIC. Furthermore, those formally trained in searching CD-ROM ERIC retrieved more relevant citations than those not trained on the CD-ROM database. The Mann Library study strongly suggests that training students in the use of optical disc databases increases the efficiency of database searching. (Eaton, MacDonald and Saule 1989, 60)

The variation in experience among libraries reported in the literature suggests that some factors contributing to CD-ROM training requirements are specific to the site and the skills of its user population. Nonetheless, many of the issues raised may be instructive, and some recurrent observations do emerge. Topics to be addressed below include:

- Skills required by CD-ROM users.
- Instructional topics.
- Methods of delivery.

- Obstacles to instruction.
- Requirements for staff instruction.
- Changes in reference staff roles.
- Workstation location.

### **1. Skills Required by CD-ROM Users**

Many CD-ROM products in use within libraries are similar in content and function to databases available through online services. As a result, library CD-ROM users must learn some of the database searching skills familiar to librarians conducting mediated online searches. Effective use of electronic databases requires an understanding of computer operation as well as the ability to think conceptually (Cheney 1991, 152). Lack of either skill can degrade search results (Cheney 1991, 152). Users must be given a basic understanding of search and information retrieval processes applicable to most library electronic databases (e.g. boolean logic, proximity, and strategy modification), enabling them to adapt to particular user interfaces or product features and effectively use any library CD-ROM product (Johnson and Rosen 1990, 36). Beyond that, "even those familiar with microcomputers and database construction will need to be informed about the database content, structure, and the appropriate search strategies for a particular database" (Johnson and Rosen 1990, 36). Citing the aforementioned survey of ACRL members, Whitaker

listed the following "aspects of searching" in order of importance to users:

1. Basic search commands
2. Boolean logic
3. How to use descriptors or to free-text search
4. When certain CD-ROMs are appropriate research tools
5. How a database is structured
6. How to limit by year, date etc.
7. CD-ROM technology (Whitaker 1990, 32)

## 2. Methods of Instruction

The following methods of CD-ROM user instruction are addressed in the literature:

- Group workshops, classes or demonstrations.
- Course-integrated instruction.
- One on one sessions.
- Product documentation.
- Handouts and quick reference sheets.
- Computer Aided Instruction (CAI).

### a. *Group Workshops, Classes or Demonstrations*

Group sessions are the most efficient and consistent means of CD-ROM user instruction, and should include discussion of basic search principles common to CD-ROM databases (Johnson and Rosen 1990, 38). Two thirds of the respondents in the previously cited survey of ACRL members mentioned however, that group sessions were poorly attended, sometimes by only two or three people (Whitaker 1990, 32).

Bostian and Robbins (1990, 17) assert that live demonstrations of CD-ROM products are essential to effectiveness of instruction: "Our gut feeling is that you can talk about computer searching from now until the cows come home, and the students won't know much more than when they started." In their study of the effectiveness of various methods of CD-ROM searching instruction at Plymouth State College (New Hampshire), they found that students who attended a lecture without a live demonstration employed search strategies similar to those receiving no instruction or only an in-house handout (Bostian and Robbins 1990, 17). Flat panel overhead projection systems for use in display of computer output to groups are readily available and have proven effective for CD-ROM instruction at the University of California, Santa Cruz (Jaffe 1991).

*b. Course-integrated Instruction*

At some schools, librarians provide formal CD-ROM classes in support of specific curricula. Such services are provided regularly at the University of North Carolina, Chapel Hill (UNC-CH) (Amato and Jackson 1990, 16). UNC-CH librarians include live CD-ROM demonstrations and discuss the role of CD-ROM in the larger context of the full range of reference resources available in the library (Amato and Jackson 1990, 16). While these classes are considered successful, Amato and Jackson note that they require

adequate classroom and computer hardware support, and require a high level of staff proficiency and currency with respect to all supported CD-ROM products. Presentations similar in scope are often conducted at the University of California, Santa Cruz in course or project related sessions requested by professors (Jaffe 1991).

*c. One on One Instruction*

One on one (also called "point of use") instruction is considered the most effective but least efficient means of CD-ROM user instruction (Whitaker 1990, 31). One on one instruction may be provided by appointment or on demand. Amato and Jackson (1990, 15) argue that "there is no substitute for the 'one on one' instruction that occurs near the reference desk and which is based on the unique and immediate need(s) of a user"; and note that a concurrent "brief introduction" to the print counterpart of the database, if available, is often useful. In Whitaker's survey of ACRL members, "an overwhelming majority of respondents reported that patrons learn best with one to one, point of use instruction in using CD-ROM products" (Whitaker 1990, 32).

Pfarrer (1989, 145) found that 75 percent of librarians "spend 15 minutes or less with new CD-ROM users and fewer than 6% . . . require more than 30 minutes."



Four of the librarians interviewed by the author cited questions about use of equipment (printers, paper, "stuck" workstations etc.) as a significant proportion of demand for one-on-one assistance. Three cited non-students or "outsiders" as a significant source of questions.

*d. Product Documentation*

Documentation provided by the CD-ROM publisher may be a useful resource for user self-instruction if maintained at or near the workstation. Publishers may also provide quick reference material in addition to more in-depth manuals.

*e. Handouts and Quick Reference Sheets*

Most libraries provide handouts or quick reference sheets at CD-ROM workstations in lieu of (or in addition to) publishers' product documentation (Whitaker 1990, 33). Appendix I provides samples. ACRL member survey respondents indicated that, while this material is "helpful for almost all patrons", computer literate students are more likely to find it adequate for effective self-instruction (Whitaker 1990, 33). In the Plymouth State College study, Bostian and Robbins (1990, 17) found that CD-ROM users given little or no instruction are more likely to use search aids.

(1) *New York University - A Different View.*

Pavelsek (1991) outlines the history of CD-ROM user instruction at New York University's Stern School of Business, where CD-ROM instruction methods have evolved over several years from mandatory workshop attendance as a condition of use to reliance upon handouts alone. She points to "availability of menu-driven, user-friendly systems and the greater computer sophistication of most college students . . . [as] two important factors contributing to the reduction, if not the entire elimination, of the need for end-user instruction" (Pavelsek 1991, 298). Elaborating further, she states:

Currently, New York University Libraries offer nearly 20 end-user products, and more will be acquired in the near future. Obviously, it would not be feasible to provide instruction for each, and fortunately that is neither necessary nor desired. College and graduate students of today possess a much higher degree of computer literacy than students of only a few years ago, and they are capable of using the menu-driven databases available in most college and university libraries without special instruction. (Pavelsek 1991, 299)

Handouts covering basic procedures are employed at the Stern Library to supplement hands-on experience at the workstations. Addressing the issue of users for whom the handouts are inadequate, Pavelsek adds:

Of course, there will always be students who do require additional instruction. Time constraints permitting, individualized help may be offered. At the very least, users can be directed to product literature designed to get them on their way. Actually, in the recent experiences of Stern Library staff, such students are rare. (Pavelsek 1991, 299)

Pavelsek noted that questions from users of one product at Stern (Dow Jones News Service) declined significantly despite the elimination of classroom training (Pavelsek 1991, 298-299).

*f. Computer Aided Instruction*

Computer Aided Instruction (CAI) may refer to online tutorials provided as an integral part of a CD-ROM product or instructional software developed in-house. Some users are more likely to make use of online tutorials than printed guides, but such use can be a "mixed blessing" as users must tie up a workstation in order to complete the tutorials (Whitaker 1990, 33). Eaton, MacDonald and Saule (1989, 61) note that users "seem to prefer" self-paced instruction. Development of in-house CAI resources require a considerable investment of time by people with the requisite computer skills. If current staff members do not possess those skills, significant training time is required to develop them (Amato and Jackson 1990, 20). Examples of successful use of CAI include a stand-alone system for training users of SilverPlatter products at the University of Charleston (Harrington 1990, 12) and "Research Assistant", a tool used by students for topic development and source location at New York University's Bobst Library (Amato and Jackson 1990, 20). At the University of Vermont, a CAI/workbook training option was preferred by 80 percent

of users over workshops (Eaton, MacDonald and Saule 1989, 61).

### **3. Obstacles to Instruction**

Summarizing responses from surveyed ACRL librarians, Whitaker cited the following obstacles to effective CD-ROM instruction (Whitaker 1990, 33-34):

- Insufficient staff and/or time.
- Inadequate equipment for group instruction.
- Non-standardized search software.
- "Convincing users to attend group sessions or otherwise spend the time necessary to develop searching skills" (Whitaker 1990, 34).

Some libraries chose to limit assistance to CD-ROM users due to resource limitations. Temple University was unable to offer "widespread training" due to staffing limitations (Maxymuk 1990, 26). Ten percent of the 633 libraries responding to Pfarrer's (1989) survey (of academic institutions with a student population over 500) provide no assistance to patrons using CD-ROM databases.

### **4. Requirements for Staff Instruction**

In order to train and assist library patrons, staff members must understand the features and operation of supported CD-ROM databases and related hardware. Also, as updates of supported CD-ROM products arrive, there may be changes to the search and retrieval software features and

procedures. Therefore, initial and recurrent staff training requirements must be considered in connection with CD-ROM implementation. Amato and Jackson observe:

For any kind of instruction to succeed, all members of the reference staff must keep abreast of changes in database content and search software. Regular staff training and practice and search times are needed. Both staff and patrons need current, well written documentation. Looking beyond daily contact with CD-ROM products, it is important for reference staff to keep abreast of the availability of CD-ROM products and other information technologies elsewhere on campus. (Amato and Jackson 1990, 21)

Similarly, Johnson and Rosen (1990, 36) state that "all staff who are likely to be helping clients should be well-versed in the use of databases", and recommend that a single individual be designated to learn new systems and provide training to staff members. They further suggest that staff members be allowed time to practice and become proficient with a product's features before it is made available for library patron use (Johnson and Rosen 1990, 36).

Practices in libraries visited by the author at which several staff members are involved in CD-ROM user assistance closely reflect the above observations and recommendations. A variety of methods, including hands on practice sessions, seminars, newsletters and briefs are employed with the objective of ensuring staff competency with all supported CD-ROM products. At the University of

California, Santa Cruz, a "lead person" is designated to coordinate staff training for each database (Jaffe 1991).

#### 5. General Comments

It is apparent from review of the literature that the combined effects of many factors determine the full extent of demands placed on a library staff for staff and patron instruction as a result of public access CD-ROM database implementation. Eaton, MacDonald and Saule summarize the patron training issue as follows:

The decision to train patrons in optical disc searching and the methods to be used in training depend ultimately on an individual library's staff resources, on the complexity of the systems used, as well as on the library's overall philosophy toward bibliographic instruction. Certainly not all disc databases should require training. In some special libraries, where searchers are familiar with print indexes in a certain field and where they may have already done some online searching, no training or support may be necessary. In any case, librarians should consider administrative implications as well as long-term instructional goals when deciding what kind of searching support should be offered or required. (Eaton, MacDonald and Saule 1989, 61)

Not specifically cited (yet alluded to) in the preceding quote, the informational needs and existing computer related skills of a library's patron population should be included among the factors considered when developing a strategy for optical disc user instruction.

The Association of College and Research Libraries published a planning checklist (ACRL 1991, 431) for use in developing instructional programs for end-user searching of

CD-ROMs, online databases and online catalogs. It addresses various methods of instruction, including classroom, one-on-one, CAI, and printed material.

#### **E. CHANGES IN THE ROLE OF REFERENCE LIBRARIANS**

Whitaker (1990, 32) asserts: "The popularity of CD-ROM is changing the nature of reference work." This statement exemplifies a recurrent and significant theme in the literature relating to CD-ROM instruction. With several electronic databases in the library, including the more traditional mediated online services, the best resource(s) for a particular patron's research needs may be more difficult to isolate. Many users do not understand distinctions in scope and coverage offered by different electronic sources (Johnson and Rosen 1990, 36). Despite success with reduced levels of formal instruction at NYU, Pavelsek (1991, 299) identifies "lack of understanding by both students and faculty about what types of information are available on computerized systems and what can reasonably be expected of them" as a problem remaining to be addressed. Some users are inclined to believe that search of a single CD-ROM source provides exhaustive coverage of their topic, or may interpret failure to locate information during a CD-ROM search to mean that none exists (Johnson and Rosen 1990, 40). To meet currency and comprehensiveness

needs of some patrons, a mediated online search may be the best answer (Johnson and Rosen 1990, 36).

It is increasingly incumbent upon the reference librarian to assist the patron in matching his/her research needs to the resources available (Harter and Jackson 1988, 521). According to Broughton, Herrling and McClements (1991, 17) "helping the user select one or several databases is almost as important as the search strategy used to obtain the information". Dunning (1989, 210) observes that offline database introduction allows librarians to "concentrate on advising users rather than serving them." Harter and Jackson (1988, 521) assert that librarians should be aggressive in assisting users to identify the reference tool(s) appropriate for their needs. Such assistance can be provided in several forms, including signs, instructional handouts, or reference desk interviews (Johnson and Rosen 1990, 36). Appendix J provides examples of handouts serving this purpose at the University of California, Santa Cruz and the U.S. Naval Academy.

In a broader sense, there is an emerging need for librarians to assess their objectives relating to bibliographic instruction in an environment of emerging technology (Harter and Jackson 1988, 525). Librarians must decide to what degree they should concern themselves with the quality of electronic searches conducted by end-users (Harter and Jackson 1988, 525). Eaton, MacDonald and Saule



(1989, 60) suggest that "library users who can understand and efficiently search online or disc databases will also be more efficient library users overall." These acquired skills may be valuable to patrons over their entire professional careers (Eaton, MacDonald and Saule 1989, 60).

#### **F. IMPACT OF PUBLIC ACCESS OPTICAL DISC RESOURCES ON LIBRARY STAFFING REQUIREMENTS**

The degree to which public access optical disc resource implementation will impact library staffing requirements is dependent upon several variables, some site specific.

Addressing electronic reference sources in general, Harter and Jackson state:

Staffing considerations cluster around three dimensions:

- routine maintenance demands
- user assistance requirements
- implications for the role and functions performed by the reference librarian (Harter and Jackson 1988, 520)

Discussions presented earlier in this chapter and by Harter and Jackson (1988, 523) suggest that the following site specific factors are among those impacting staff workload:

- The characteristics of the installed hardware/software suite, including: presence/absence of networking, ease of use, provisions for printing and downloading, equipment reliability, frequency of software updates, and commonality of search and retrieval software.

- Staff and patron computer skill levels and training requirements.
- Research/informational needs of patrons.
- Library management decisions regarding the types and levels of patron support to be provided, consistent with the library's bibliographic instruction objectives and resource limitations; and the methodologies chosen to provide that support (handouts, workshops, CAI, etc.). This factor is characterized by Harter and Jackson (1988, 523) as "...the extent to which the library is willing to help users do a better search than they would otherwise have been able to do."

Although not specifically analyzed in the literature reviewed for this thesis, it is logical to assume that the size of the potential user population for each implemented optical disc database will impact cumulative demand for assistance and instruction by staff.

While the literature supports an expectation that optical disc implementation will increase staff workload, no prescriptive methodologies are offered for determining precisely how many additional man hours of staff time will be required to meet this demand in a given setting. It is possible however, to address specific functions or services that should be accounted for in planning based on the experience of librarians who have implemented CD-ROM databases.

#### **1. Public Services Staff Functions**

Zinc (1990, 54) states: "Perhaps the greatest impact of CD-ROM in a library is the workload for the public

services staff in whose area the CD-ROM is located."

Responsibilities identified in the literature for public services staff include:

- Training patrons to use public access systems (Rhine 1990, 20).
- Supporting patrons during use of optical disc products (development of search strategy, employment of search software features, etc.) (Clark 1990, 2).
- Assisting patrons in selection of appropriate database(s) to search (Broughton, Herrling, and McClements (1991,17), (Harter and Jackson 1988, 521).
- Routine maintenance and troubleshooting of workstations (extracting optical discs from floppy disc drives, installing new ink cartridges, rebooting workstations, etc.) (Wood 1990,16). The majority of respondents (63 of 73) in a 1990 survey conducted by the Association of Research Libraries indicated that librarians are involved in equipment troubleshooting (Clark 1990, 2).
- Issue and control of discs (for stand-alone workstations supporting more than one optical disc product or a product requiring multiple discs).
- "Assisting library systems staff in planning, developing, and implementing public access systems" (Rhine 1990, 20).
- "Possessing an advanced level of expertise in using application systems and 'basic' level of understanding of the technical aspects of these systems" (Rhine 1990, 20).

Optical disc databases may not increase public service staff workload in all settings, according to Zinc. He observes that in "such specialized areas as the sciences, government publications, and business", where significant time is spent teaching users to effectively use print

indexes, implementation of optical disc sources could actually reduce user assistance demand (Zinc 1990, 55).

## **2. Maintenance and Support Functions**

Routine maintenance demands include compiling statistics, equipment maintenance, servicing printers with paper and ribbons, and circulating discs (Harter and Jackson 1988, 571). The latter function may not pertain if a local area network with multiple optical disc drives is employed, eliminating the need for "disc swapping" and allowing disc drives to be located at a site not accessed by patrons.

Other functions that must be performed include:

- Provision of safeguards for equipment (Huang 1989, 62).
- Preparation and update of locally produced demonstrations, handouts and reference material (Eaton, MacDonald and Saule 1989, 52).
- Training staff to operate hardware and perform routine troubleshooting and maintenance (Zink 1990, 54).

Maintenance functions may be split among different groups within the library (e.g. public service or systems staffs), depending on the technical skill required. Other potential resources include an institutional computer center or centralized support organization outside the library. According to Pasternak (1990, 21), "to a great extent, the size of the library, the nature of the system it supports, and the technical expertise of the staff in the library and the computing center will determine the relative

responsibilities of the different groups for implementing and maintaining library systems." Regardless of the chosen distribution of responsibilities, rapid correction of equipment problems is an essential component of adequate service (Clark 1990, 2).

Citing experience in the Norris Medical Library at the University of Southern California, described as medium sized academic medical library with a staff of 41, Wood (1990, 18) advocates ongoing training of librarians to ensure their familiarity and comfort with computers related to their jobs. Lewis observes in a similar vein:

Support from technically expert staff will be required, but raising the level of computing expertise among all public service librarians should be of prime concern. They are, and will remain, the most important resource in building and servicing electronic scholarly resources on our campuses. (Lewis 1990, 18)

Wood also supports a degree of technical self-sufficiency for librarians. He states:

An institutional Computer Services department may be available by telephone or e-mail, but librarians at the reference desk are called upon to help users who have tried to print 3000 references and do not know how to cancel the print command, whose workstation needs to be rebooted because it has "hung", or who have put the CD-ROM in the floppy disc drive. (Wood 1990, 16)

Rhine (1990, 19) sees a limited support role for institutional computer center staff. She cites "library system complexity and user interface design" as factors, and envisions the computer center staff more appropriately

involved in interface of library systems with campus-wide systems (Rhine 1990, 19).

Wood observes that in-house technical support personnel can be employed to significant advantage. She again cites experience at the "medium-size" University of Southern California medical library, where in-house "consultants" maintain hardware (including a LAN), support and train both users and staff, and maintain close liaison with the institutional computer center (Wood 1990, 17). A similar approach was followed in the Science Library at UCSC, where a staff member was hired to maintain and manage public access computer systems, while also providing training and assistance to staff and patrons (Watson 1991). In both cases, technical support personnel are supervised by librarians and have acquired understanding of library procedures and policies, increasing their utility (Wood 1990, 17), (Watson 1991). Appendix K provides a functional description of the UCSC position.

All but one of ten libraries visited by the author rely upon microcomputer maintenance support located within the library itself or controlled by a campus library staff. The ninth relied upon a local vendor and was experiencing significant difficulty bringing a small network into operation.

### **3. Management Functions**

Several management functions should be assigned to members of the library staff in support of an optical disc system. Eaton, MacDonald and Saule (1989, 52) cite the following functions:

- Overall coordination and oversight.
- Evaluation of current systems and recommendations for additions/changes.
- Bibliographic control.
- Monitoring of copyright and licensing restrictions.

Eaton, MacDonald and Saule (1989, 52) stress the importance of early assignment of responsibility for overall management of optical disc resources, as well as the need for clear lines of responsibility.

### **4. Local Area Network Staffing Considerations**

Installation of a local area network (LAN) to provide optical disc reference services will require additional functions to be performed in support of LAN operations. From a survey of 106 academic library members of the Association of Research Libraries, Laguardia, Huber and Doyle (1991, 38) concluded that CD-ROM networking requires a greater level of technical expertise than most librarians possess. In responding libraries operating CD-ROM LANs, sixty-five percent employ technicians, systems personnel, computer center staff, or vendor personnel to

support their installations (Laguardia, Huber and Doyle 1991, 38).

According to Kratzert (1990, 203), libraries electing to network CD-ROMs "quickly discovered that they needed to have an innovative computer person on their staff." This individual typically plans, evaluates and manages library computer systems (Kratzert 1990, 203). Some smaller libraries attempt to rely upon institutional computer center staff for this support, but Kratzert (1990, 203) asserts that this is rarely successful, because "these people are usually not available when needed for trouble shooting on a daily basis and do not always understand library applications."

In an effort to identify personnel skills required to support a CD-ROM LAN, a query was forwarded by the author to all members of the BITNET discussion group CDROMLAN. Respondents identified the following skills: understanding of DOS, LAN technology and software, CD-ROM related software, and menu software. Several respondents indicated that primary LAN management responsibility at their libraries is centered on a single library staff member. Four respondents estimated the proportion of that staff member's time devoted to LAN management; two reporting 50 percent (one reported workload tapering to 10 percent over time); one reporting about twenty hours per week; and the fourth reporting one third of the staff member's workload



dedicated to the LAN, with a greater demand in early stages of implementation.

#### 5. General Comments

Additional demands placed on a library staff to support optical disc systems, including requirements for staff training, may require addition of personnel or adjustment of existing staff routines (Littlejohn 1991, 17). Of the libraries visited by the author, only one reported an increase in staffing directly attributable to CD-ROM. Two hired technical support personnel based on overall library automation workload, including online catalogs, CD-ROM and other microcomputer applications. The majority absorbed any additional workload imposed by CD-ROM among existing librarian and technical staff. Some libraries employ students or trained support staff to augment librarians in support of CD-ROM searching. Seven of thirty-eight respondents to Whitaker's (1990, 33) survey of ACRL members used students and graduate assistants in this role.

According to Eaton, MacDonald and Saule (1989, 53) the assignment of optical disc system staffing functions and responsibilities within a public service department should reflect the department's existing structure and strengths. Gray (1990, 23) argues that there may be no "best" staffing scenario and suggests consideration of the following questions:

A more universal series of questions of interest to all types of libraries are: For whom are we designing these systems? Who will provide the best perspectives for ensuring that the design is sound, the ideas will be accepted in the organization, the implementation will go smoothly, support will be continuous and responsive to user needs, and evaluation will be iterative to ensure a constantly evolving product? (Gray 1990, 23)

Regardless of the distribution of functions among staff, it is important to assign individual responsibility for their execution (Eaton, MacDonald and Saule 1989, 52-53).

Harter and Jackson offer the following general observations:

. . . one must determine whether a system under consideration will make personnel demands that the staff is unable to meet because of a lack of time, knowledge or skills, or understanding of potential systems benefits. New systems may call for different abilities and skills than those required by previous systems. The extensive staff instruction that may be required, as well as changed job responsibilities, is likely to be met with resistance. Changes in philosophy of reference service, design of a vigorous user assistance program, changes in staffing patterns, and employment of additional reference staff may also be necessary. The benefits of these systems must be considered in relation to these personnel requirements. (Harter and Jackson 1988, 521)

In summary, common themes in the literature relating to optical disc staffing issues include:

- The importance of effective planning to define the implementation, management and support roles for library staff and personnel from other organizations.
- The advantages of adequate in house staff support for local area network administration, maintenance, and training support.

- The need to train library staff members to perform routine equipment service and minor troubleshooting.
- The impact of library management decisions regarding the types and level of support to be offered to users, based on available resources and the degree to which the library chooses to concern itself with the quality of end-user searching.
- The role of site specific factors in determination of staffing demands, including the nature of the chosen equipment suite, the informational needs of patrons, and the computer skills of patrons and staff.

#### **G. IMPACT OF PUBLIC ACCESS OPTICAL DISC RESOURCES ON OTHER LIBRARY REFERENCE MEDIA**

The introduction of public access optical disc resources in libraries has impacted the utilization of other library reference media, including print indexes and online databases. A brief synopsis of trends documented in the literature will be presented, as well as a discussion of issues relating to elimination of other media in favor of CD-ROM alternatives.

##### **1. Impact of CD-ROM Reference Resources on Use of Online Database Services**

Implementation of public access CD-ROM databases often reduces the usage frequency of online database services. For example, Maxymuk describes the experience of Temple University Library:

We chose ERIC and PsycLit on CD-ROM because they were our most heavily-searched databases online. It was no surprise that they are also our most popular CD-ROM databases. It was also no surprise that due to heavy

CD-ROM use, mediated, fee based online searching took a dive. Comparing September through December 1987 to the same months in 1988, online searching on DIALOG declined 41% and on BRS 72%. (Maxymuk 1990, 27)

Similar results have been observed at other libraries. Tenopir (1991, 61) reported that mediated online searching in the University of Hawaii Library's Humanities/Social Science Department "went from an average of 56 per month in a ten month period between May 1988 and February 1989 to only 11 per month in the first ten months of 1990." Simultaneously, she noted, CD-ROM searches "skyrocketed" (Tenopir 1991, 61). Online searching at Vanderbilt declined 58 percent in two years (Tenopir 1991, 62). Pfarrar (1989, 144) reported that more than 83 percent of librarians responding to his survey believe that CD-ROM can be "a cost effective alternative to a heavily used online database for reference purposes." This trend is also reflected at all of the libraries with online services visited by the author. The University of California, Berkeley Business Library experienced a reduction in online searches of approximately 75 percent following CD-ROM implementation (Ternberg 1991).

Online searching costs are normally tied to the amount of time spent searching; thus the more an online service is used, the greater the expense. Some libraries pass online costs to the individual requesting or conducting the search. At such libraries, cost provides a major

incentive for patrons to look to CD-ROM to meet their searching needs (Bernal and Renner 1990, 25). Tenopir and Neufang (1991, 86) concur, citing a 1991 survey of Association of Research Libraries members reflecting a decline in online use at 82% of ninety five responding libraries, of which 95% charge for online searching. Other libraries, including the Naval Postgraduate School's Dudley Knox Library, do not charge patrons for online searches. At these libraries the impact of CD-ROM database availability on demand for online services is less intuitively obvious. Where patrons are not charged, there may also be controls applied to limit online searches to those situations in which they are best justified. For example, the Naval Postgraduate School library conducts comprehensive online subject searches for students only in direct support of thesis projects, and requires a faculty thesis advisor's endorsement prior to the search.

In one study documenting the impact of CD-ROM on mediated online searching at a library not charging patrons for online services, Bernal and Renner (1990, 25), found no long term decrease in demand for online searches. This study was conducted at the James A. Haley Veterans Hospital Medical Library. Bernal and Renner (1990, 25) noted two trends following CD-ROM implementation of *MEDLINE*, a popular medical database:

- Demand for librarian-mediated online searches initially declined, but quickly returned to previous levels.
- CD-ROM searching, at the same time, steadily increased.

Bernal and Renner (1990, 25-26) concluded that other factors besides cost must contribute to CD-ROM demand, citing ease of use, a positive perception of CD-ROM passed from librarians during one on one instruction, and the ability of users to browse the database.

Correlation of the James A. Haley Veterans Hospital study findings with what might be expected to occur in an academic library not charging patrons for online services is difficult due to differences in mission and patron population.

## **2. Impact of CD-ROM Reference Resources on Use of Print Resources**

Several reports in the literature document library staff and patron preference for CD-ROM reference sources over print media. For example, results of the Pioneer Project (a study of CD-ROM cost effectiveness, acceptance and use at the U.S. Department of Commerce's Mountain Administrative Support Center [MASC]) indicated preference by both staff and users for CD-ROMs over conventional media (Welsh 1989, 60). Amplifying that result, Welsh (1990, 60) cited CD-ROM's "powerful searching options not possible with printed or microform media." Taylor (1989, 454) cited

elimination of the need to search several printed volumes to encompass an adequate time span as a reason for student preference for CD-ROM over print indexes. In a survey of 736 reference librarians at U.S. four year colleges and universities, Pfarrer (1989, 144) found that 59 percent of librarians at libraries using CD-ROM expect that CD-ROM use will decrease demand for printed sources. Reese (1990, 28) noted a decrease in use of the three most popular print indexes at the Vanderbilt University Education Library following introduction of CD-ROM versions.

From at least one perspective, a decline in use of print indexes may be cause for some concern. Langlois offers the following observation:

One overwhelming concern of librarians pertains to the user's tendency to ignore the printed indexes when they can search a CD-ROM system. After performing a search, users may assume they have complete information and may not check other sources for more data. (Langlois 1990, 18)

### **3. Cancellation of Print Indexes Duplicated on CD-ROM**

CD-ROM products that duplicate print resources offer the potential to employ CD-ROM as replacement for print media. As Nicholls (1991a, 26) points out, new CD-ROM products are often optical versions of "respectable, established online databases that used to be available only in print; even though abstracts or full text may be added . . ." Given the duplication of printed bibliographic indexes by CD-ROM versions offering the previously cited advantages

to the user, librarians are presented with the option to cancel the print versions (Clark 1990, 1). In some cases, they have chosen to do so. For example, Welsh (1989, 60) reports that the Department of Commerce MASC library purchased *Dissertation Abstracts OnDisc* and not only canceled, but discarded, the print version of Dissertation Abstracts, saving thirty-five linear feet of shelf space. Brock University cancelled five print equivalents (Stewart 1990, 13). Clark (1990, 1) asserts that most libraries that have canceled a print index duplicated on CD-ROM have canceled only one of two print copies, retaining the second to supplement the CD-ROM version.

The University of Virginia's Computer-Assisted Information Services Committee developed a written policy for cancellation of print reference sources duplicated by online services or CD-ROM. The following criteria are among those addressed by the policy (Association of Research Libraries 1990, 45):

- Conduct evaluations on a title by title basis.
- For the print and CD-ROM versions, balance the relative costs, user needs for each medium and anticipated use levels.
- Compare currency of print and computer versions.
- Consider likely number of simultaneous users and ability of computer resources to meet demand.
- Consider space requirements of print versus computer versions.



- Determine content commonality of print and computer versions.

There are a number of arguments for retention of print versions of bibliographic indexes after procurement of CD-ROM versions, including:

- CD-ROM discs are often leased, not owned by the library. If the CD-ROM subscription is canceled, all discs may have to be returned to the publisher (Reese 1990, 28).
- If the CD-ROM index is implemented on a single user, non-networked workstation, only one user may access the index at a time. For example, Reese (1990, 28) reports use of popular database print versions at Vanderbilt when CD-ROM workstations are busy.
- If the CD-ROM workstation or network fails, the index would be temporarily unavailable to users.
- For some searches, the print version remains more appropriate. This concept will be elaborated below.

Further complicating the cancellation decision process, some publishers offer deep discounts on CD-ROM subscriptions to subscribers who also retain their print subscriptions to the same database. For example, in "Information Services Catalog 1992", INSPEC (Information Services Division of The Institution of Electrical Engineers [IEE]) offers the *INSPEC Ondisc* version of three abstract journals for \$7,500. Subscribers to the print versions of the three journals can subscribe to *INSPEC Ondisc* at a discounted rate of \$3,500.

Nicholls summarizes the current approach of librarians to this issue as follows:

. . . CD-ROM service is typically an additional rather than a replacement service. Most librarians are either unwilling or unable to relinquish their print subscriptions at this stage, so the CD-ROM is an extra burden on the budget. (Nicholls 1990, 100)

#### 4. The Print-Disc-Online Continuum

A recurrent theme in the literature dealing with library CD-ROM applications is the concept of CD-ROM databases as intermediate level searching tools, situated on a scale between printed sources (including microform) and mediated online services. Amato and Jackson (1990, 23) view CD-ROM as one option, and not always the best one, for meeting information needs and assert that for some disciplines, print resources cannot be supplanted by CD-ROM. Eaton, MacDonald and Saule (1989, 51) state: "Optical sources can be used as a cost-effective intermediate step between print and online searching." They present CD-ROM as a component of a "Print-Disc-Online Continuum" (Eaton, MacDonald and Saule 1989, 48). Reese (1990, 32) warns against allowing "the power of CD-ROM [to] cloud the other non-technical approaches to research which may yield valuable information." Reese (1990, 32) and Amato and Jackson (1990, 21) cite the advantage of online databases over CD-ROM with respect to update frequency when conducting searches in which currency is a high priority. This distinction is blurred to some degree in the case of CD-ROM databases that offer online update through the CD-ROM user

interface during CD-ROM search sessions. Databases published by the H. W. Wilson Company, for example, provide this capability.

#### H. IMPACT OF CD-ROM RESOURCES ON PERIODICAL AND MICROFORM COLLECTIONS

Several currently available CD-ROM databases provide full text coverage of periodicals, newspapers, or other sources. These databases may provide coverage of material duplicated in a library's collection by print or microform subscriptions, prompting questions regarding the need to maintain duplicate copies on different media. For example, University Microfilms International's (UMI) *IEEE/IEE Publications Ondisc (IPO)* is an image database containing the publications of the Institute of Electrical and Electronics Engineers (IEEE) and the Institution of Electrical Engineers (IEE). A UMI product flyer dated 1991 states that IPO "features complete material from IEEE/IEE publications, including text, formulas, charts, diagrams, photos, and illustrations" (UMI 1991a). The flyer also indicates that the initial shipment of discs encompasses nearly one half million pages of material, with additional material provided on a monthly basis. Given the shelf space devoted to the print versions of these publications, the expense of print subscriptions, and the subscription cost of the corresponding CD-ROM product (up to \$28,000 annually for

IPO), the need to retain print subscriptions to IEEE/IEE publications is a logical question to be addressed by a library implementing IPO.

In an example relating to microform subscriptions, UMI's *ProQuest Newspapers OnDisc* series offers full text coverage in ASCII format of several major newspapers, including New York Times, Washington Post, and Wall Street Journal. Each subscription includes current year and at least two backfile years. These databases are text only, and do not provide the complete content of the newspapers, omitting graphic material. UMI markets *ProQuest Newspapers OnDisc* as a complement to microform rather than a replacement. A UMI promotional flyer distributed in 1991, titled "ProQuest Newspapers OnDisc" states:

For the perfect research and retrieval combination, add ProQuest Newspapers OnDisc to your existing newspapers-in-microform subscriptions. Microform allows easy access to the complete, uncut archival newspapers, while CD-ROM puts the entire editorial content' [footnote indicates that wire service material may not be included] at your fingertips electronically. Together, the two media form a long-lasting archival information base with immediate, convenient access--at a most affordable price. (UMI 1991b)

**1. Cancellation of Periodical or Microform  
Subscriptions Duplicated on CD-ROM**

Many of the same arguments for retention of print versions of bibliographic indexes duplicated by CD-ROM apply as well in the cases of print/microform periodical or newspaper subscriptions. The access 'imitations of single

(non-networked) workstations, susceptibility to equipment failure, and potential license restrictions on retention of discs remain valid. Some publishers also offer significant discounts to CD-ROM subscribers who maintain print version subscriptions. For example subscribers to all IEEE/IEE journals, conference proceedings and standards may receive IPO for \$16,000 annually as opposed to the \$28,000 normal subscription fee.

Considerable cost savings may be realized by substitution of full text CD-ROM products for print or microform versions. To illustrate this point, a comparison was conducted in October, 1991 of the list of periodicals provided in full text ASCII format in *Computer Select* (a computer periodicals and product database published monthly by Ziff Communications Co.) and the holdings of the Naval Postgraduate School's Dudley Knox Library. At that time, the Knox Library subscribed to forty-six publications included in *Computer Select*. Based on prices published in The Serials Directory: An International Reference Book (EBSCO Publishing, 5th ed., v. 1-3) and *Ulrich's Plus* (R.R. Bowker Co., CD-ROM, Summer 1991), annual subscription fees for these publications total \$4391.00. The *Computer Select* annual subscription fee is \$995.00. Thus, cancellation of the forty-six print subscriptions could save \$3396.00 annually.

There are however, some tradeoffs. For example, *Computer Select* does not include graphics or tables associated with the text of the original published material. Also, the *Computer Select* license agreement prohibits use of the monthly superseded disc simultaneously or separately in addition to the current disc. *Computer Select* cannot therefore be archived. Since each disc contains only the most recent twelve months of material, the oldest articles available at any time to users will be one year old.

Conversely, while UMI's *IEEE/IEE Publications OnDisc (IPO)* provides graphic images of publications exactly as they appear in print, it does not include the full text of the IEEE/IEE publications in machine readable (e.g. ASCII) format. Although *IPO* does allow electronic searching of an abstract database covering the publications included in the image database, the full text of articles cannot be downloaded to floppy disc, and a laser printer is required to copy material from the image database.

**a. CD-ROM Suitability for Archiving**

There is also concern over suitability of the CD-ROM medium for long term archiving. Elshami (1990, 55) states that " while CD-ROM is expected to be an appropriate long term archiving medium and an effective tool in the publishing industry for non-volatile data, Write-Once-Read-Many (WORM) systems are most appropriate for archival

storage." In the same publication however, he asserts that "the life expectancy of all optical storage media is questionable because not enough is known about the physical and chemical characteristics of these materials" (Elshami 1990, 59). Saffady (1991, 72-73) points out that the term "archive" means different things when applied to computer versus library applications, implying a greater degree of permanence in the latter case.

Saffady (1991, 73) asserts that "while they have attracted the interest of preservation specialists, currently available optical storage media have no known archival properties." In amplification, Saffady (1991, 73) cites lack of published standards for permanence, instability of the medium relative to paper and microform, and susceptibility of discs to damage from aging, environmental effects and manufacturing defects.

A recently introduced disc product uses alternative materials to achieve archival stability. The *Century Disc*, developed by DIGIPRESS, is specifically aimed at archival applications requiring a storage medium lasting 100 years or longer (Oudard 1991, 42). In the *Century Disc*, organic materials found in the normal CD are replaced by minerals and all unstable substances are replaced with more durable substitutes (Oudard 1991, 42). Tempered glass replaces the normal CD's plastic, gold replaces the aluminum reflector, and the label is chromium dioxide (Oudard 1991,

44). The *Century Disc* is undergoing an accelerated aging test program in cooperation with the Library of Congress, and is available in all optical disc formats (Oudard 1991, 46). Oudard (1991, 42) asserts that the *Century Disc* satisfies the requirement for an archival medium to meet widely accepted standards. The new disc is expensive however, with a cost per disc in the CD-ROM format ranging from \$500 to \$830 depending on quantity purchased (Oudard 1991, 46).

*b. Durability of CD-ROM Technology*

A related issue concerns the expected longevity of CD-ROM as a viable technology for information storage. Some librarians are concerned that the pace of advancing technology will render CD-ROM obsolete and unsupported. Barnes and Spragg (1990, 89) state: "Conventional wisdom holds that CD-ROM is a transitional storage technology which will be replaced by some other format." Meanwhile, Nicholls (1991a, 7) documents continued strong growth in the CD-ROM industry and Nelson (1990, 23) declares that "CD-ROM has firmly entrenched itself with librarians - even though they may fuss about licenses and other problems." It does not appear to the author that such concerns deter librarians from implementing CD-ROM reference databases. The above quotation of Barnes and Spragg, for instance, was drawn from



an article presenting a case study of their institution's experience with nine CD-ROM products.

**c. Observations**

It is the author's impression that the decision to cancel print periodical or microform subscriptions in favor of CD-ROM equivalents must involve thorough analysis of: the features of the specific CD-ROM database(s) under consideration, the needs of library patrons for access to the resources involved (including requirements for easy access to tables, illustrations, and other graphic material published with original sources), the requirement to maintain stable long term archival copies of the material, and the relative costs involved (again specific to the CD-ROM product).

**I. IMPACT OF CD-ROM IMPLEMENTATION ON INTERLIBRARY LOAN (ILL) ACTIVITY**

As with printed indexes, CD-ROM bibliographic databases do not confine citations displayed to a user to the domain of publications held within a library's collections. This fact, plus the previously mentioned greater search efficiency offered by CD-ROM, may generate an increase in requests for material not held locally. Nicholls (1990, 102) and Langlois (1990, 17) suggest that CD-ROM will increase interlibrary loan (ILL) rates. Taylor (1989, 454) documents such an increase at the University of North

Carolina, Chapel Hill. Six of the librarians interviewed by the author reported increases in ILL activity believed attributable to CD-ROM.

#### **J. WORKSTATION LOCATION**

Respondents to Whitaker's survey of ACRL members indicated that the placement of CD-ROM workstations in the vicinity of the reference desk resulted in increased workload at the desk, but enhanced the ability of librarians to conduct point of use instruction, reduced user frustration, and allowed librarians to watch for users having problems (Whitaker 1990, 32). Clark (1990, 2) found that most libraries place CD-ROM workstations near the print resources that serve similar purposes (in the reference section or near collections related to CD-ROM content). With the exception of the Science Library at the University of California, Santa Cruz (UCSC), all sites visited by the author in connection with this thesis maintained their CD-ROM workstations in the vicinity of a reference desk. At UCSC, a separate room is devoted to electronic media including CD-ROM, but is manned by a staff member or student assistant familiar with supported CD-ROM products.

#### **K. USER INTERFACES**

As pointed out in Chapter II, a CD-ROM publisher may select search and retrieval software for use in conjunction

with each product. As a result, Nicholls (1991a, 9) reports that there are "perhaps 200 unique search and retrieval software packages . . . now applied on commercially available CD-ROM titles, presenting a definite challenge to both end-user instruction and the librarian's sanity." The impact of this diversity is somewhat blunted by two factors: the predominance of a relatively few frequently used packages and the existence of families of products employing the same package (SilverPlatter, Dialog OnDisc etc.) (Nicholls 1991a, 9). By choosing multiple products from these families, when consistent with other selection priorities, a library can reduce the effects of interface diversity (Nicholls 1991a, 9). Initiatives to further improve the library's control over interfaces are discussed in a later section of this chapter.

#### **L. SECURITY**

Planning for public access optical disc systems should address issues of security for hardware, optical discs, and software. Libraries visited in connection with this thesis employ a variety of security methods to protect the investment of funds and time incurred in provision of optical disc service. The degree to which security measures are implemented appear to be based on judgments made regarding threats posed by the patron populations involved and the vulnerabilities and inherent security features of

the chosen hardware and software configurations. Security issues that should be addressed include measures to:

- Ensure physical security of workstation hardware.
- Ensure physical security of CD-ROM discs.
- Prevent alterations to system and application software.
- Prevent introduction of viruses.
- Prevent use of workstations for unauthorized purposes.
- Provide rapid recovery from inadvertent or intentional attacks.

#### **1. Hardware Security**

Measures to protect workstation hardware parallel those commonly employed in any public access microcomputer installation. Workstations and external CD-ROM drives may be secured by commercially available physical locks, such as cables and Anchor Pads (Koga 1990, 64). The presence of observant library staff members is also a deterrent and is facilitated by placement of workstations near a public desk (reference desk, etc) (Stover 1989, 18). After hours, standard building security measures provide a degree of protection (Koga 1990, 64).

#### **2. CD-ROM Disc Security**

The read-only nature the CD-ROM medium itself assures integrity of the data on the disc. On the other hand, the portability of the disc renders it vulnerable to theft. Improper handling may damage the disc and result in

a service interruption pending arrival of a replacement. Vendor policies vary with respect to replacement discs. Some vendors offer free replacement, while others charge a fee (Stover 1989, 20). Measures to prevent disc theft include:

- Issuing discs from the circulation desk to each user (observed at Stanford University Engineering Library).
- Mounting discs in lockable CD-ROM drives (Stover 1989, 19).
- Mounting CD-ROM drives within a locked enclosure (e.g. a cabinet below the workstation, observed at University of California, Berkeley Business Library).

If CD-ROM databases are available in local area networks, effective disc security may be maintained by placement of the optical disc server in a non-public area, such as a separate room or space behind the circulation desk. This option is employed, for example, at the University of California, Santa Cruz Science Library and the main libraries of the U.S. Naval Academy and San Jose State University.

Because CD-ROM discs are similar in size to 5.25 inch floppy diskettes, they are occasionally inserted into floppy drives at sites where discs are issued for use on stand-alone workstations. Preventive measures include covering the floppy drive slots with a velcro-secured panel, allowing access for downloading when desired.

### 3. Protecting System and Application Software

Knowledgeable and determined patrons may access and alter software on hard discs by gaining access to the DOS prompt or by rebooting a workstation with a floppy disc (Koga 1990, 63-64). Once such access is gained, the patron may alter files on the hard drive, introduce a virus, or employ the workstation for an unauthorized purpose. Koga (1990) describes in some detail several options for circumventing such efforts, including:

- Use of a menu system to isolate users from DOS.
- Use of boot protection utilities.
- Use of a utility program to make hard disc "read only" (may be infeasible if CD-ROM applications write to hard disc in execution, as does *Computer Select*).
- Use of utility programs to change file attributes.
- Removal, hiding, or renaming DOS "external" command files (e.g. *FORMAT.COM*).
- Use of "byte level" editors to rename DOS "internal" command files.

### 4. Virus Protection

In addition to measures restricting access, commercially available virus detection and removal software can be employed to protect workstations or networks from viruses. For example, the U.S. Naval Academy library uses *Direct Net 5.1* to provide menuing and virus protection functions for a CD-ROM network.

## **5. Backup and Recovery**

While hardware failures or malicious attacks may not violate the integrity of the data on a CD-ROM disc, the time required to reconfigure a workstation, even a stand-alone installation, may be considerable (Dixon 1990, 101). Dixon (1990) recommends backups to avoid unnecessarily long service interruptions. Koga (1990, 66) recommends backups of AUTOEXEC.BAT and CONFIG.SYS files or customized files such as menu systems. There are many commercially available backup utilities to serve this purpose. Experience with the *Computer Select* workstation established at the Naval Postgraduate School library indicates that, for a stand-alone workstation, all of the files maintained on a CD-ROM workstation hard drive may be backed up on a few floppy discs.

### **M. A MAINFRAME BASED ALTERNATIVE TO OPTICAL DISC DATABASES IN LIBRARIES**

As an alternative to (or in addition to) online database services accessible by modem, libraries with access to mainframe computer resources may elect to subscribe to databases in tape format. These tapes are loaded at the mainframe and accessed through terminals in the library or at other sites with mainframe access.

Tape loading of databases corresponding to those available online or in CD-ROM format is very expensive and

requires substantial mainframe disc space (Porter 1991, 90). Tape loading may be appropriate for heavily used databases, particularly if campus-wide access is desired. For example, this approach is employed for some widely used databases at Stanford University (Gass, 1991).

#### **N. FUTURE DEVELOPMENTS**

Along with continued growth in the volume of data published on optical discs, evidenced in a constant stream of new product announcements, emerging multimedia hardware and software products are receiving a great deal of attention in computer industry press. The impact of multimedia applications on academic library operations remains to be seen. As discussed in Chapter II, much of the multimedia effort is aimed at the consumer marketplace.

A significant effort currently underway which may, in its fruition, significantly affect library optical disc applications is the expansion of CD-ROM standards to facilitate interoperability.

Proliferation of unique, proprietary user interfaces complicates the librarian's task of supporting CD-ROM databases. It is possible to be faced with teaching both staff and patrons a different interface for each CD-ROM product selected for a library's collection. Current initiatives offer the prospect of eliminating the requirement to use specific user interface software to



access data on a CD-ROM through adoption of a client server architecture (Ciuffetti 1991a, 28).

Three separate initiatives seek to develop standards for a client/server architecture (Ciuffetti 1991a, 28):

- Information Retrieval Protocol (Z39.50).
- Structured Full-Text Query Language (SFQL).
- CD-ROM Read-only Data Exchange (CD-RDx).

Client/server architecture involves separation of the CD-ROM retrieval software into two independent components. The server component performs functions necessary to search for data on the CD-ROM disc (Ciuffetti 1991a, 27). The client component performs the user interface functions, translating user's commands into a format understood by the server (Ciuffetti 1991a, 27). A standard client/server protocol defines the format and content of communications between the two components (Ciuffetti 1991a, 27). In concept, any user interface compliant with the client/server standard could access any CD-ROM using a compatible server, allowing users to select the interface to be employed (Ciuffetti 1991a, 28). Given this capability, librarians could chose interfaces that best match the characteristics of a database and patron needs, while improving standardization among CD-ROM products within the library.

CD-RDx, sponsored by the U.S. Government intelligence community's Information Handling Committee, carries the

interoperability goal one step further, providing for portability of CD-ROM databases across operating system boundaries, achieving platform independence (Shapiro 1991).

#### **O. SUMMARY**

This chapter is intended to provide background information covering issues that should be addressed in planning and implementation of library public access optical disc resources. Coverage of each topic is intentionally general and not limited in applicability to a specific library. As discussed in connection with several of these issues, their relative impact will be affected by site specific factors including the library's mission, patron population, resources, organizational structure and other variables.

Missing from the literature reviewed for this thesis is data relating the size of a supported student population and the impact of various implementation issues. Also, little information is available distinguishing the demands generated by patron populations consisting only of faculty and graduate level students from those including undergraduates.

Harter and Jackson (1988, 524) stress "the importance of evaluating optical disc systems from both the technical standpoint and the organizational context." Continuing on this theme, they advise:

In determining the balance between print, online, and in-house electronic sources and between mediated service and direct access by users, librarians must consider how these systems will contribute to meeting the mission and goals of their library. This calls for an understanding of "typical" information problems and how library users search and acquire needed information. Since this pattern will vary from one clientele and type of library to another, librarians must collect and study data about information gathering characteristics of their own users. (Harter and Jackson 1988, 524)

Experience at the Naval Postgraduate School suggests that libraries considering initial or additional public access optical disc resources can gain insight and experience regarding site specific factors through a prototyping process. This approach provides the opportunity to observe user acceptance and demands generated on staff and other library programs by specific products considered for implementation.

Specific recommendations in Chapter VIII for CD-ROM implementation in the Dudley Knox Library at the U.S. Naval Postgraduate School will draw upon the background provided by this chapter.

As the optical disc publishing industry matures and evolves, current library and technical journals should be monitored for updated information about the issues addressed in this chapter.

## VII. HARDWARE FOR OPTICAL DISC SUPPORT

Information managers or librarians seeking to implement public access optical disc database are presented with several hardware alternatives. Identification of the hardware configuration that best fits a particular setting is influenced by several factors, including the number of optical discs supported, volume of use anticipated for each optical disc database, security concerns, and cost.

This chapter will present an overview of four optical disc hardware configuration options drawn from three categories (differentiated by method employed for individual workstation access to supported CD-ROM discs):

- Stand-alone workstations with one or more CD-ROM drives attached.
- Peer-to-peer networks.
- File server based networks.
- "Turn-key" CD-ROM network systems (file server based).

Considerations for selection among the above options will be discussed. A representative set of products for implementation of each option is provided in Appendix L to support rough cost comparisons.

No attempt will be made to address technical details of CD-ROM related hardware operation beyond that necessary to

adequately describe the four configuration options listed above.

While it is recognized that CD-ROM applications have been developed to support a broad range of computers and operating systems, including UNIX based machines, library applications are predominately within the domain of IBM PC compatible and Apple Macintosh systems (Nicholls 1991a, 14). Further, IBM PC compatible workstations enjoy a significantly larger product base for CD-ROM applications compared to the Macintosh (Nicholls 1991a, 14). As of mid-1991, 90 percent of CD-ROM products would run on IBM compatible workstations and 20 percent supported Macintosh, although the number of products supporting both Macintosh and IBM, or Macintosh only, was increasing (Nicholls 1991a, 14). This chapter will therefore focus on IBM PC compatible hardware options. For the purposes of this discussion, the terms "workstation" and "microcomputer" are synonymous.

#### **A. STAND-ALONE WORKSTATIONS**

The simplest hardware configuration for CD-ROM support is the stand-alone workstation. A CD-ROM workstation may be an IBM PC compatible minicomputer with one or more CD-ROM drives attached.

To connect the workstation and CD-ROM drive, one of two types of interfaces will be used: (1) an interface proprietary to the drive manufacturer or (2) a Small

Computer System Interface (SCSI). If a proprietary interface is used, it will be compatible only with the drives offered with it by the drive manufacturer (Thompson and Maxwell 1990, 240). A SCSI interface offers the ability to "daisy chain" several drives (up to seven) to a single controller card, facilitating support of multiple CD-ROM products or products employing more than one disc (Warren, 1986).

Other components of a stand-alone CD-ROM workstation typically include search and retrieval software for CD-ROM products to be accessed by the workstation, device driver software, and Microsoft MS-DOS CD-ROM Extension (MSCDEX) software. MSCDEX allows access to CD-ROM drives in the same manner as hard or floppy disk drives (Perratore 1991, 336). According to Thompson and Maxwell:

MSCDEX assigns drive letters to the CD-ROM devices, translates between the disk storage format DOS expects to see and the CD-ROM disk, and controls the drive. If a company does not use the Microsoft CD-ROM Extensions, it must provide its own software to do the same job. (Thompson and Maxwell 1990, 240)

Menu software, such as Automenu, may be added to isolate the user from DOS and provide user-friendly access to CD-ROM databases or other software supported on the workstation.

Stand-alone CD-ROM workstations may be used for access to single or multiple CD-ROM discs. Multiple disc access can be achieved by disc swapping, "daisy chaining" multiple drives to the workstation, or attachment of a jukebox. A

jukebox is "a single unit featuring a CD drive and a disc changer loaded with multiple discs that can be selected and used as required", one disc at a time (Jaffe and Watkins 1992, 62).

Attachment of CD-ROM drives to a stand-alone workstation does not preclude the use of other microcomputer applications, such as word processors or spreadsheets, at the workstation.

#### **1. Advantages and Disadvantages of Stand-alone Workstations**

Stand-alone workstations offer the least technically challenging means of access to CD-ROM databases (Jaffe and Watkins 1992, 66). They are well suited to situations where user demand is low, and in such settings may represent the least expensive way to support several databases (Jaffe and Watkins (1992, 66). As previously mentioned, their versatility can be enhanced by "daisy-chaining" or attachment of a jukebox.

McQueen (1990, 13) cites several disadvantages of stand-alone workstations, including:

- Inability to level demand for databases among workstations, resulting in queues at some workstations supporting heavily used databases while others sit idle.
- Poor security, especially if disc swapping is required; with discs susceptible to theft or damage from mis-handling.
- Increased reference desk workload if discs are issued on a per-use basis.

In the author's view, some demand leveling is possible with stand-alone workstations by dedicating workstations to more popular databases while using multiple drives or jukebox arrangements for less frequently used products.

## **B. CD-ROM NETWORKS**

This section will present general descriptions of two major types of networks for support of CD-ROM: peer-to-peer and file server based systems.

### **1. Peer-to-Peer Networks**

In a peer-to-peer network, resources located at individual microcomputer workstations, including CD-ROM drives, are shared with other workstations across the network without use of a dedicated network file server (Jaffe and Watkins 1992, 62). CD-ROM drives may be attached to any workstation on the network, and each workstation so equipped becomes, in effect, a CD-ROM server as well as a search station (Ciuffetti 1991b, 12). Thompson (1991, 335) asserts that "to maintain maximum compatibility, all DOS-based [peer-to-peer] LANs with built-in CD-ROM support use MSCDEX for accessing the CD-ROM drives." Artisoft's Lantastic exemplifies this category of network products.

According to Derfler (1990), "file-server software in peer to peer networks resides in the individual PC's memory and divides or 'slices' the time of the processor between file services and the standard applications."



Thus, each workstation retains the ability to run other DOS applications while acting as a server (Derfler 1990).

Kriz, Jain and Armstrong (1991) describe the design and implementation of a successful peer to peer network based on *Lantastic* at Virginia Polytechnic Institute and State University. The network described includes eight public access workstations supporting eight CD-ROM databases (Kriz, Jain and Armstrong 1991, 28).

## 2. File Server Based Networks

In file server based networks, all of the networked CD-ROM drives are attached to one or more servers (Ciuffetti 1991b, 12). Perratore (1991, 338) differentiates two server based topologies founded upon: (1) redirector software and (2) *NetWare* Loadable Module (NLM) based products.

Networks based on redirectors normally employ a dedicated microcomputer CD-ROM server (80286 or better) (Perratore 1991, 338). Several popular CD-ROM network products use redirectors, including CBIS's *CD Connection*, Meridian Data's *CD-Net* and Online Computer Systems' *Opti-Net* (Perratore 1991, 338). Each of those products supports use of expanded/extended memory for disc caching, as well as any of the following server operating systems: *LAN Manager*, *NetBIOS*, *NetWare*, or *VINES* (Perratore 1991, 350).

Networks based on NLMs use the network file server as the CD-ROM server (Perratore 1991, 338). Products using

this approach include Microdesign International's *SCSI Express* and Corel Systems Corp.'s *CorelDriver* (Perratore 1991, 338). Both of these products support only the Novell *NetWare* server operating system (Perratore 1991, 350). Perratore (1991, 348) warns buyers to determine if any of the CD-ROM applications to be used require *MSCDEX* in order to function after the network connection is made (most do not) because such products "probably won't run with *SCSI Express*."

A more detailed discussion of redirector and *NLM* based server operations, considered beyond the scope of this thesis, is provided by Perratore (1991).

CD-ROM servers may consist of any suitable microcomputer connected to one or more CD-ROM drives and configured with one of the products mentioned above. Redirector based CD-ROM "tower" servers containing several CD-ROM drives are available as integrated units from *CBIS* and *Meridian*, and employ *CD Connection* or *CD Net* software, respectively (Perratore 1991, 338). According to Perratore:

The companies that sell complete tower PC systems bundled with their software say they have tailored their drivers for optimum performance with the CD-ROM adapter they package. But our tests indicate that the software sometimes offers better performance when used with equipment other than that supplied by the company. (Perratore 1991, 334)

### 3. "Turn-key" CD-ROM Networking Systems

Although products known to the author in this category employ the file server network configuration discussed above, "turn-key systems are considered here as a distinct CD-ROM implementation option based on the complete package of components and services they provide. "Turn-key" systems, as the name implies, relieve the purchaser of responsibility for much of the work involved with CD-ROM network design, installation and configuration. According to SilverPlatter Information, Inc.'s September 1991 MultiPlatter Q & A Sheet, for example, a *MultiPlatter Basic Unit* includes: a CD-ROM server with seven or fourteen drives; four Ethernet interface cards for use in workstations; network communications software; *MultiPlatter Application Manager Software*; documentation; toll-free customer telephone support; on-site installation; and local System Administrator training by SilverPlatter. The purchaser separately provides suitable IBM PC compatible workstations. The same document indicates that SilverPlatter Information, Inc., views its *MultiPlatter* system as a solution for organizations with a need to network CD-ROM applications, but without the technical expertise to install or maintain a suitable network.

#### **4. Application Servers**

Ciuffetti (1991b, 12) notes that "file servers and peer to peer workstations can only share their CD-ROM media and not their CPUs" and that, in both configurations, search applications run on the individual workstations. He observes that a "still immature" technology employs an application server in the network that shares its CPU capacity to run search applications for the users (Ciuffetti 1991b, 12). This configuration eliminates the need to install new or updated search and retrieval software for CD-ROM databases onto the hard disks at each workstation (Rutherford 1990, 22).

#### **5. Network Performance Factors**

The following factors are among those cited in the literature as affecting performance of CD-ROM networks:

- CD-ROM drive seek and throughput rates (CD-ROM drives are considerably slower than hard disc drives. Seek times of 500 milliseconds are acceptable, but new drives can achieve less than 350 milliseconds, according to Jaffe and Watkins [1992, 66]. The faster the drive, the better for LAN applications [Bridges and Gerber 1990, 93]).
- Server and workstation processor speed (the faster, the better, particular with heavy use [Bridges and Gerber 1990, 93]).
- Memory available for caching (Bridges and Gerber 1990, 93).
- Network speed: Ethernet is faster than token ring (PC Week tests [Bridges and Gerber 1990, 93]).

- Quality of access software running on workstations that redirects local disk calls to networked CD-ROM drives (Bridges and Gerber 1990, 93).
- Speed of local or server hard drives (Rutherford 1990, 26).

## 6. Relative Advantages/Disadvantages of Peer-to-Peer and File Server Based Networks

Peer-to-peer networks offer the following

advantages:

- Redundancy: if a peer workstation fails, the others remain functional unless accessing a drive at the failed workstation (Ciuffetti 1991b, 14).
- Easy to upgrade from stand-alone workstations: requires only network cards, cables, and software; and does not require purchase of a server (Ciuffetti 1991b, 14).
- Lowest cost upgrade from stand-alone workstations, fully utilizing existing workstations and drives (Jaffe and Watkins 1992, 67).

Disadvantages of peer-to-peer networks include:

- May be slow due to sharing of processor between local applications and server duties (Jaffe and Watkins 1991, 67).
- Slow when multiple users search a popular database (Jaffe and Watkins 1992, 67).
- In public access settings, drives and discs are more vulnerable (Jaffe and Watkins 1992, 67).
- No disc caching for increased throughput from drives accessed by multiple users (Thompson 1991, 335).
- May not preserve MSCDEX functionality for remote CD-ROM drives, resulting in incompatibility with databases requiring that function (Ciuffetti 1991b, 13).

- May not save money if peer workstations require upgrades to processor speed and RAM in order to provide adequate network performance (Ciuffetti 1991b, 13).

#### Relative advantages of a file server based network

include:

- Improved security: all drives and discs can be centrally located outside public areas (Ciuffetti 1991b, 12).
- File servers may be optimized to support CD-ROM, making full use of processor capacity and disc caching (Ciuffetti 1991b, 12).
- Improved security: failure of a workstation will not make a database unavailable to other users (Ciuffetti 1991b, 12).
- Enhanced maintenance of relatively uniform response time through use of functions that queue data retrieval requests (Jaffe and Watkins 1992, 68).

#### Disadvantages of the file server network approach

include:

- High initial cost (Jaffe and Watkins 1992, 68).
- Failure to take full advantage of existing drives (unless all can be attached to the new server) (Jaffe and Watkins 1992, 68).

#### C. SELECTION OF WORKSTATION HARDWARE

Jaffe and Watkins (1992, 66) present five factors for consideration when selecting CD-ROM drives:

- Speed: look for 500 millisecond access times or less.

- Compatibility with host microcomputer and other drives (for daisy-chaining).
- Expandability: ability to be daisy-chained.
- Reliability: good performance record and resistant to dust.
- Security: ability to lock the disc into drive may be important in some settings.

"The faster the better" seems to be a common theme in discussions of workstation hardware to support CD-ROM, particularly in a peer-to-peer network. Nicholls (1991a, 14) suggests that, as the number of multimedia titles rises, ". . . DOS 5.x and 1Mb RAM is really the sort of minimum system to think about, even now." Grossman (1992, 71) recommends an 80386 or 80386SX-based microcomputer with 4Mb of RAM and Quarterdeck Office Systems' QEMM-386 memory management software. A hard disk drive is a necessity for support of some CD-ROM products (including *Computer Select*) which create temporary files during searches.

#### D. CHOOSING A HARDWARE CONFIGURATION

As discussed at the beginning of this chapter, the choice among the several possible hardware approaches to CD-ROM implementation is influenced by a mix of organizational and technical factors. Advantages and disadvantages were presented for each of the alternatives discussed above. This section will present observations from the literature regarding the process of choosing among them. First, a

decision should be made regarding the need for a network. If a network option is chosen, a second decision will define the network type.

#### 1. The Stand-alone Workstation versus Network Decision

The decision to install a network or to rely upon stand-alone workstations to distribute CD-ROM based information may be influenced by several factors. Jaffe and Watkins state:

The primary advantage of CD-ROM networking is the ability to provide simultaneous access to multiple databases by multiple users. If demand is such that at least several of your CD-ROM databases receive moderate to heavy use (frequent queuing, for instance) then a network should be seriously considered. However, if user demand is only low to moderate, then installing jukeboxes, daisy-chained drives and more stand-alone stations might be perfectly viable solutions for supporting even a large number of discs. (Jaffe and Watkins 1992, 67)

Additional decision factors cited by Jaffe and Watkins (1992, 67) include cost and "institutional demand for remote access to CD-ROM databases." They warn that cost assessments should consider the expense of modifications to the involved building and furnishings. Noting that institutional demand for remote access may be a major consideration, Jaffe and Watkins (1992, 67) advise decision makers to "not underestimate the technical obstacles that still exist and remember that licensing restrictions or exorbitant pricing may make it taboo or financially



impossible to mount even your most heavily used database on the network."

Another factor to consider in connection with networks is the increase in staff workload imposed by network administration, as discussed in Chapter VI.

## **2. Choosing a Network Type**

Jaffe and Watkins (1992, 67) assert that selection of a network type is setting dependent, pointing out that the field of candidate network products may be narrowed slightly by determination of the ability of each candidate to support intended CD-ROM applications. Ciuffetti (1991b, 14) is more direct, stating that "in a public access environment, a file server approach offers the best alternative, with added security and stability the deciding factors." His observation, it should perhaps be noted, comes from the perspective of the Technical Director at Silverplatter Information, Inc.

Rutherford (1990, 27) recommends that "organizations lacking personnel willing to take over the task of network installation and maintenance should look for turn-key solutions from companies such as SilverPlatter."

## **E. WIDE AREA NETWORKING AND REMOTE ACCESS**

Thorough discussion of wide area networking of optical disc databases is beyond the scope of this thesis. Based on the literature reviewed for this project, it is the author's

impression that network distribution of CD-ROM-based information across different network protocols requires careful planning and must address compatibility issues relating to an individual networked CD-ROM application environment as well as the network hardware and software. In addition, previously addressed licensing and subscription cost issues must be considered when a CD-ROM product is made accessible to more potential users.

Remote access to CD-ROM databases via modem is feasible using products such as Dynamic Microprocessor Associates' *PC Anywhere III* remote communications software (RCS). Kriz, Jain and Armstrong (1991, 28) describe successful use of this technique at Virginia Polytechnic Institute and State University.

Remote communications software such as *PC Anywhere III* allows a remote user to control the functions of a workstation, including CD-ROM searching using the search and retrieval software located on the host workstation (Bell 1990, 190). The remote user's monitor presents the same information appearing on the host's monitor, and "printing or downloading of files can also be directed from the host to the remote, so the capture of information by a remote user is not a problem" (Bell 1990, 191). Proper function of remote communications software requires that both involved microcomputers be equipped with the same RCS software, a

modem, and adequate RAM to run the RCS package in addition to other loaded applications (Bell 1990, 191).

Bell (1990) describes a number of advantages and disadvantages of remote communications software use for remote access to CD-ROM databases. Advantages include the ability to provide access to CD-ROMs after library working hours by leaving a host configured to accept calls (Bell 1990, 192). Citing experience of the Wharton School at the University of Pennsylvania, Bell also asserts that faculty are "much more likely to use information technologies they can access directly through their own microcomputers, than those they must use at the library" (Bell 1990, 191-192).

Disadvantages of remote communications software cited by Bell (1990, 192-193) include: the fact that a host workstation engaged in RCS communication is unavailable to patrons in the library; the need for user instruction on RCS use; and potential loss of control of access to the library's resources if copies of the RCS are widely available. Of course, any remote access allowed must comply with licensing agreements covering databases made available to users by that method.

#### **F. GENERAL CONSIDERATIONS**

Jaffe and Watkins (1990, 67) offer the Decision Matrix in Figure 1 as an aid to determine an appropriate hardware strategy for distributing CD-ROM information. It

"illustrates the relationship between use and demand and the number of discs or databases that must be available to users at any given time in order to avoid excessive queuing" (Jaffe and Watkins 1992, 67). Options presented include purchase of multiple subscriptions for standalone use instead of networking, a server based network and standalone workstation mix, and mainframe tape loading of heavily used databases requiring wide distribution (Jaffe and Watkins 1991, 67).

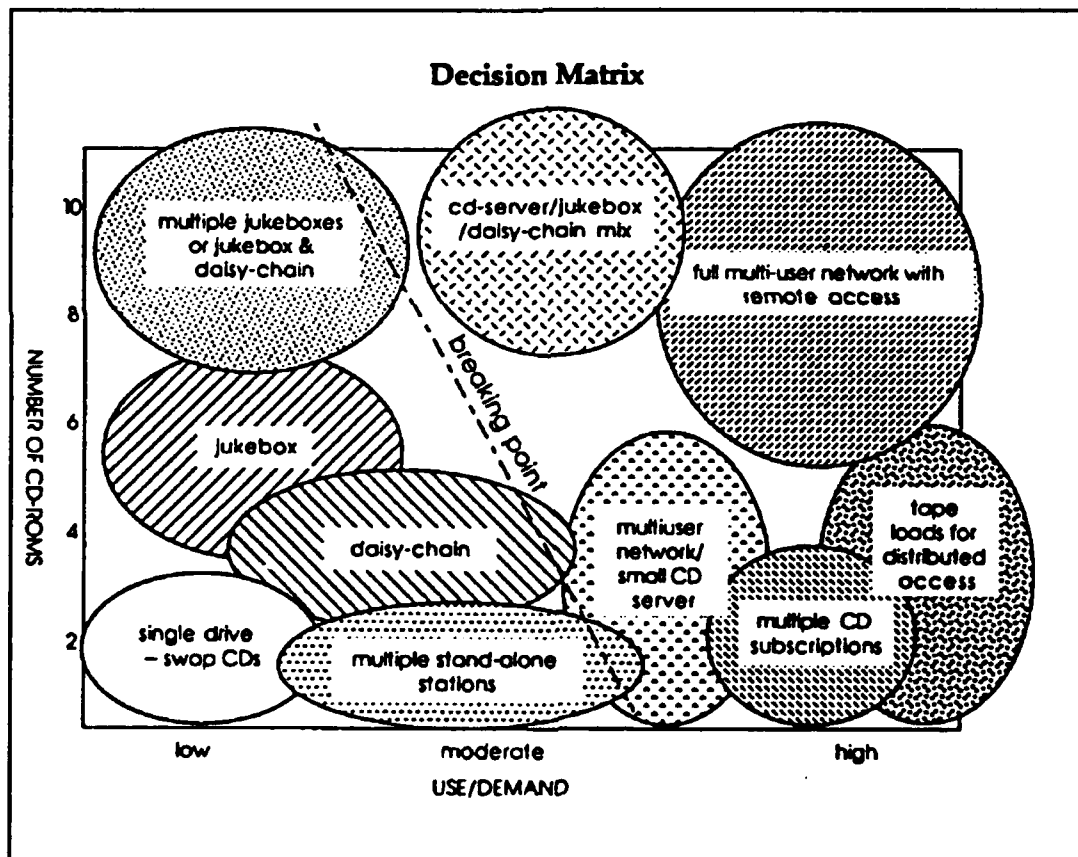


Figure 1 Decision Matrix (Reprinted with permission from CD-ROM Professional, Vol. 5 No. 1, Copyright 1992 Pemberton Press)

If, as suggested by Jaffe and Watkins (among others), user demand is a major factor determining the best hardware configuration for CD-ROM support, some means must be employed to estimate or measure that demand. It is the author's impression that an incremental approach to CD-ROM implementation, beginning with standalone workstations, will support direct observation of user demand. In a similar vein, Jaffe and Watkins conclude their article on CD-ROM hardware configuration selection with the following observation:

Much of what we have described constitutes a logical progression: it is quite possible to start with a standalone, single drive station, incrementally add drives and stations and eventually network these to build capability as demand increases. CD-ROM services will be a moving target for some time to come. Whatever system is installed may have to be the foundation of future installations. Within this context, it is important to develop plans and proposals in terms of growth and flexibility. (Jaffe and Watkins 1991, 68)

McQueen also stresses the need for continued reassessment and planning:

On a small scale, networking is certainly more expensive than standalone. However, starting small should not be confused with thinking small. It is easy to keep purchasing standalone resources because the investment threshold is small. The problem with this approach is that organizations can nickel-and-dime their budget and spend more in the long run. The nickel-and-dime approach is easy, but it typically does not create an atmosphere of long-range planning. The absence of long-range planning, of which hundreds of management theory books have addressed, generally results in poor utilization of resources. When applied to the complexities of CD-ROM and LAN, nickel and dime investing breeds functional systems that do not meet the organization's dynamic and growing needs. (McQueen 1990, 14)

## VIII. RECOMMENDATIONS

### A. PREFACE

This chapter provides recommendations for implementation of public access optical disc databases in the U.S. Naval Postgraduate School's Dudley Knox Library. The measures proposed represent the opinions of the author, and reflect the experience gained in execution of this thesis project, including the product survey and workstation trial described in Chapters IV and V, and analysis of the implementation issues presented in Chapter VI.

The author is not a librarian, and does not claim complete knowledge of Dudley Knox Library current operations, management challenges and priorities not related to optical disc implementation, or the qualifications and performance level of most individual staff members. The recommendations below will (in most cases) define what might be done, given management decisions to pursue optical disc implementation, without prescribing details of procedure or individual responsibility. These are matters best left to library management.

### B. DUDLEY KNOX LIBRARY OPTICAL DISC PROGRAMS

As mentioned in Chapter V, prior to implementation of Computer Select under the auspices of this thesis, no public

access optical disc databases were in place in the Dudley Knox Library. Two databases were in use by librarians, one of which (a Defense Technical Information Center [DTIC] database) supported patron research while the other (*Books in Print Plus*) was used by the Acquisitions staff.

During meetings preliminary to this project, library managers demonstrated familiarity with the characteristics and capabilities of CD-ROM databases, as well as some related implementation issues. An interest in adoption of CD-ROM technology for patron use was expressed, but focused on the long term. No organized effort had been initiated to identify databases appropriate to the library's mission or to plan in detail for their introduction and support. Other higher priority library automation programs competing for limited staff resources (primarily implementation of a *NOTIS* online public access catalog system), and concerns regarding the ability of the Reader Services staff to absorb additional sustained workload related to CD-ROM support, were cited as primary reasons for delay of CD-ROM implementation.

#### **C. RECOMMENDATIONS**

The following recommendations focus on five general objectives:

- Resolution of policy issues that will affect all aspects of CD-ROM implementation.

- Determination of the proper role for optical disc databases in the context of overall Dudley Knox Library services.
- Initiation of planning and preparation activities focused on both the short and long term, including assignment of individual responsibilities.
- Further use of trial implementation(s) (prototyping) to develop improved estimates of the impact of CD-ROM implementation on staff workload and other library programs.
- Definition of an overall recommended strategy for CD-ROM implementation.

### 1. Preliminary Decisions

The first decision to be addressed is fundamental: Should CD-ROM databases be purchased and supported for patron use in the Dudley Knox Library? If that question can be answered affirmatively, then planning and preparation activities of broad scope should begin now. If a decision is made not to implement CD-ROM databases in the foreseeable future, staff time expended on CD-ROM should be limited to that required for key personnel to remain abreast of developments in CD-ROM and related technology and products, so that the decision might be readdressed if warranted by changing circumstances. If insufficient information is now available to make this decision, further prototyping is recommended in an effort to clarify the pertinent issues.

It is the author's opinion that CD-ROM databases should be added to the Dudley Knox Library's collection. They offer significant improvement of end-user access to



information in the library. As discussed in Chapter VI, justification for CD-ROM implementation lies in improved service to the patron, not in cost savings.

A second decision involves funding. In the author's view, three scenarios are possible. In the first, planning for CD-ROM implementation would be initiated with the knowledge that funding for collection development, hardware procurement, and on-going support (including staffing) must be confined within specified target levels. Planning would then proceed with the objective of optimizing employment of those available resources. In the second scenario, planners would be tasked with definition of the optimum CD-ROM product suite, hardware configuration, and support structure to meet the library's objectives. Funding would then be sought to implement that plan. In the third scenario, an incremental approach to collection development and hardware procurement/installation, with concurrent incremental support structure development, would be pursued. A relatively small number of CD-ROM products would be identified for initial implementation, an appropriate hardware configuration selected, and adequate support measures put in place (again accounting for staffing demands). Planning would continue as necessary for expansion of the collection, hardware, and support structure while experience is gained with the existing suite.

Expansion would take place only when resources can be identified to support it.

If a decision is made to implement CD-ROM databases, a third preliminary decision should address the degree to which the library will concern itself with end-user search quality. This choice will drive many later decisions regarding end-user instruction methodology and other types of patron support. At one extreme, for example, all patrons could be required to attend a formal training session prior to accessing a CD-ROM database, while at the other extreme, the handouts-only approach described by Pavelsek (1991) might meet the library's objective.

## **2. Follow-on Prototyping**

It is recommended that the existing Computer Select workstation, described in detail in Chapter V, be retained indefinitely for public access. Its support costs in terms of staff time have proven negligible. The Systems Librarian or a member of the Reader Services staff should be assigned permanent responsibility for routine Computer Select workstation maintenance, which has also proven to be minimal. The Systems Librarian has been indoctrinated with respect to the workstation configuration, operation and menu software.

A second CD-ROM public access workstation should be installed in the Dudley Knox Library's reference section.

It should support a bibliographic index (non-full text) database selected from among the candidates identified in Appendix B. Optimally, the chosen product should appeal to a different or broader segment of the student population than *Computer Select*. Equally important, it should be one for which a large usage rate is anticipated. A printer should be provided at the workstation to allow immediate printing of citations and/or abstracts located during end-user searches. Sufficient data should be collected to determine usage level, type and frequency of user assistance required, workload and supply expenses associated with printer support, and any impact on Interlibrary Loan or mediated online search demand. This second workstation trial should also extend for a period of three months, if possible. One of the many free trial offers available from CD-ROM publishers may be used to support this project. A CD-ROM version of a print index used frequently by Dudley Knox Library patrons may meet the above described criteria and allow library staff to derive impressions of the relative utility and value of the print and CD-ROM versions.

The need for a second workstation trial stems from questions left unanswered following the *Computer Select* trial. A bibliographic index database trial will provide experience with a product more typical of the majority of the candidate databases identified in the product survey. This trial will provide improved understanding of the impact

of such products on staff workload and other library services, given the specific setting and user population of the Dudley Knox Library. An effective demonstration of the types and frequency of user assistance requests generated by a bibliographic index CD-ROM database could be achieved, allowing more accurate management assessment of the resources required to support such products over the long term. Observation of usage rates will support determination of the most appropriate hardware suite for long term implementation. For example, if queuing is common at the workstation, a network allowing multi-user access or a second single user subscription should be considered.

### **3. Defining the Role of CD-ROM in the Dudley Knox Library**

Further experimentation with CD-ROM databases will also provide experience of value in determining their proper role in the continuum of Dudley Knox Library patron services. The degree, if any, to which CD-ROM end-user searching can reduce the need for mediated online searches should be projected. It is the author's impression that CD-ROM's primary impact in the Dudley Knox Library will be significant improvement of patron access to information currently available through print and online sources. Where exhaustive coverage and/or currency are critical, mediated online searches will remain the method of choice. The

current library policy limiting student-requested mediated online subject searches to those required in support of thesis projects may remain appropriate. Access to information sufficient to meet the needs of patrons working on course-related projects and papers would, in the author's opinion, be significantly enhanced by properly chosen CD-ROM sources. The degree to which availability of those sources would satisfy the information needs of patrons working on thesis projects and thus reduce demand for online searches will determine any potential online cost savings. In the author's opinion, inadequate information is currently available to project online cost savings.

#### **4. Planning Activities**

Assuming a decision is made to implement public access CD-ROM databases, planning activities addressing a wide range of issues should begin in the near term. This subsection summarizes issues the author believes should be addressed in planning and in some cases, specific implementation recommendations. As demonstrated in Chapter VI, implementation of CD-ROM databases can affect many aspects of library operations. Effective planning will include translation of the policy decisions addressed above into general and specific implementation objectives, and identification of support requirements and the means to meet them.

**a. CD-ROM Implementation Team**

The author recommends formation of a CD-ROM Implementation Team chaired by the Associate Librarian. Other members should represent the Reader Services, Research Reports, Acquisitions, and Systems staffs. The people chosen for this team should be interested in CD-ROM technology and the role it can play in the Dudley Knox Library. If a technical support role for the campus Management Information Systems (MIS) staff or the Learning Resources Center (LRC) staff is contemplated, a representative from that office should be included at meetings dealing with issues pertinent to that role. A MIS or LRC staff representative could provide valuable advice regarding hardware selection, installation, and support.

Functions that should be executed or monitored by the team include:

- Develop and implement a follow-on procedure for CD-ROM product evaluation. Identify participants and assign responsibilities. Use the results of the survey described in Chapter IV as a starting point. Develop or identify a checklist for use in detailed evaluation. Update the CD-ROM Collection Development Policy as needed. Draw, as appropriate, upon tools currently available in the library collection, including Nicholls (1991a) and Eaton, MacDonald and Saule (1989). Obtain and evaluate trial copies, either in public access trials or on a non-public workstation, of candidate databases prior to subscription purchase.
- Identify an initial suite of CD-ROM products for implementation in the Dudley Knox Library. Draw candidates from Appendices B and C.

- Develop and implement a standard procedure for CD-ROM acquisition, both for trial copies and subscriptions. Establish appropriate procedural steps for review of license agreements for acceptability at the library and, when considered prudent, the legal or contracting office levels. Establish order procedures and guidelines for communication with vendors consistent with procurement regulations. Assign responsibility for negotiation of license terms with vendors, in the event such action becomes necessary.
- Prescribe measures to ensure patron compliance with copyright law and license agreements. This should, at minimum, involve posting of appropriate placards at workstations advising users of restrictions on copying and downloading (see Chapter VI).
- Develop and implement a procedure for staff training, adequate to ensure that each person providing reference assistance to patrons is proficient in both use of supported CD-ROM products and in minor troubleshooting and correction of hardware faults. Assignment of a "lead person" for each CD-ROM product is a suggested means of distributing related workload.
- Monitor CD-ROM industry and library literature for announcements of new CD-ROM products and evaluate their potential as additions to the library's collection. In support of this effort, the author recommends subscription to CD-ROM Professional and restoral of the recently canceled subscription to CD-ROM Librarian.
- Subscribe to BITNET discussion groups such as PACS-L, CDROM-L, and CDROMLAN, as appropriate, and use them as sources of advice and assistance.
- Routinely assess effectiveness and value of implemented CD-ROM products. If use of a product or its quality does not justify the monetary and support costs it imposes, the subscription should be canceled.
- Develop and implement a strategy for user instruction consistent with the library's objectives and philosophy with regard to this issue. (as discussed above). Identify sources and tools for producing handouts and other user aids. Assign responsibility for their production and update. Choose any additional instructional methods (described in Chapter VI) considered appropriate and plan for implementation. Specific opinions of the author regarding user instruction will be addressed later in this section.

- Develop and oversee execution of a Hardware Configuration Plan and a Staffing Plan. Each of these plans is discussed in greater detail below.
- Design tools and procedures for assisting patrons in selection of the sources within the library most appropriate to their research needs. Roles and procedures for the Reader Services and Research Reports staffs should be addressed as well as creation of handouts. Consider the examples from the U.S. Naval Academy and University of California, Santa Cruz (Appendix J).
- Monitor the impact of CD-ROM databases on Inter-Library Loan (ILL) activity. If necessary, recommend changes to library ILL policies or procedures.
- Effectively publicize availability of CD-ROM resources on campus and promote their use. Use campus newsletters, signs at workstations, library tours, library handouts (exemplified by Appendix J), and one on one contact with patrons at the reference desk. Ensure faculty members are informed of CD-ROM resources pertinent to their fields and encourage them to point out those resources to students.

The functions described above may be performed by the team itself or assigned to other individuals, as appropriate, under the authority of the Librarian or Associate Librarian. In the latter case the team would monitor execution and provide guidance as needed.

***b. Planning for End-user Instruction***

Although no conclusions could be drawn regarding quality of searches conducted, Dudley Knox Library patrons using Computer Select were able to learn to use the database independently using printed references at the workstation. The follow-on trial recommended above will allow determination of whether the same result can be achieved



with a bibliographic index database aimed at a different primary user group. If so, well designed handouts and quick references, plus any online tutorials and help screens included with a given product, may prove adequate to meet the instructional needs of the vast majority of Dudley Knox Library patrons. If not, one on one instruction or some combination of one on one, group or computer aided instruction should be employed. Given the relative effectiveness of one on one instruction noted by Whitaker (1990) and Amato and Jackson (1990), reference desk personnel should be prepared to provide it upon patron request for all CD-ROM products in the library, regardless of other methods employed.

If improving the quality of end-user CD-ROM searches is determined to be a library objective, it is recommended that group instruction be provided to newly arriving students. Currently, new students are given a tour of the library, during which they are introduced to available research tools. These tours present an opportunity for a brief CD-ROM indoctrination, which should address Whitaker's (1990, 32) "aspects of searching". As recommended by Bostian and Robbins (1990, 17), the presentation should also include a demonstration of searches using a CD-ROM database. The demonstrated database could be chosen from among those pertinent to the audience's curriculum.

### ***c. Hardware Configuration Plan***

The hardware configuration chosen to support CD-ROM databases in the Dudley Knox Library should be based on the following considerations:

- Number of CD-ROM databases to be supported.
- Number of discs required for each product.
- Anticipated or observed usage rates.
- Long term objectives, if any, for campus-wide or remote access to CD-ROM databases.
- Cost of individual product network versus single user licenses.
- Physical security concerns.
- Availability of maintenance support.

A hardware implementation plan should be developed based on the projected rate and extent of CD-ROM collection growth. Anticipated usage rates will have to be estimated if a trial implementation has not been conducted for the product in question.

A decision to install a local area network in the near term or rely exclusively upon stand-alone workstations for CD-ROM support should be made following completion of the previously addressed follow-on workstation trial and identification of an initial CD-ROM product suite. As addressed in Chapter VII, Jaffe and Watkins (1992) provide rough guidelines for hardware configuration decisions. If a network is not initially installed, the need to do so should

be readdressed periodically as changes occur in any of the factors listed above.

If a network is not implemented initially, the following features are recommended for stand-alone workstations:

- Dedicate exclusive workstations to products with relatively high usage to avoid unnecessary queuing.
- Share a workstation among multiple products only if the cumulative demand does not result in significant queuing.
- Avoid situations requiring disc swapping by staff or users. If possible, on workstations supporting multiple products or products requiring multiple discs, "daisy chain" enough CD-ROM drives to the workstation to preclude a requirement for disc swapping. A CD-ROM Changer such as the Pioneer DRM-600, may provide an acceptable alternative. For example, six Jane's databases could be supported in one drive.
- The past history of pilferage or malicious damage in the Dudley Knox Library should be considered when determining appropriate physical security measures for CD-ROM equipment. If potential for disc theft or tampering is judged significant, lockable CD-ROM drives, lockable drive enclosures, or workstation tables with lockable built-in enclosures should be obtained.
- Install anti-virus software on each workstation and run it periodically. The Naval Postgraduate School has an existing site license for an effective antivirus program.

Hardware purchased for stand-alone workstations can be later used as network components if attention is given to compatibility during procurement. Standardization on IBM PC compatible computers and SCSI CD-ROM drive interfaces, for

example, would simplify redistribution of hardware assets (with or without a network).

For some products, the additional expense of a network license, or lack of a network option altogether, may mandate installation on a stand-alone workstation even though a network has been established to support other databases.

#### *d. Staffing Plan*

Staff workload increases must be considered as part of any plan for introduction or expansion of public access CD-ROM services. Chapter VI discusses, in some detail, the experience of other libraries with respect to CD-ROM related functions that impact staffing requirements. Some of these functions will impose transient workload increases, such as initial configuration of a network or development of handouts for a newly required CD-ROM product. Others, such as user instruction and routine workstation maintenance, will involve sustained workload demands. All of them should be considered during implementation planning and addressed through realignment of existing staff duty assignments, hiring of additional staff where justified, or arrangements with external sources of support (such as campus non-library staff).

The impact of user instruction requirements on staff workload is difficult to predict (see Chapter VI). The

amount and type of scheduled user instruction (indoctrination during tours, etc.) undertaken is one factor and, as addressed above, involves some management choices. The demand for one on one user instruction and its impact on Dudley Knox Library Reader Services staff workload may be easier to envision once a follow-on trial is completed with a bibliographic index database product. Even with that experience however, the ultimate user instruction workload imposed on the staff by a selected suite of CD-ROM products with potentially diverse user interfaces will not be known until that suite is implemented.

A staffing plan for Reader Services, therefore, must initially reflect the best judgment of library managers with respect to requirements for support of a chosen initial suite of CD-ROM products. That judgment will be supported by experience gained in the Dudley Knox Library setting through trial implementations, supplemented by the documented experience of other libraries. Planning for staff support of later CD-ROM collection growth can be based on broader first-hand experience gained through support of the initial suite of databases.

The staffing plan should address variations in patron support provided due to reduced manning outside normal staff working hours. It is not currently possible to provide full reference services in the Dudley Knox Library at all hours during which the library is open for use. The

same approach may be necessary and appropriate with regard to CD-ROM user assistance. The types of assistance available at different times should be publicized in the same way as reference assistance availability, so that patrons can plan to use CD-ROM workstations when help is available, if needed. Library attendants should be trained to perform routine functions such as workstation reboot or printer paper servicing during periods when no reference assistance is available.

A staffing plan for CD-ROM maintenance support should reflect anticipated support requirements for the chosen initial hardware configuration and should be updated as necessary in parallel with any plans for hardware expansion. The advantages of in-house maintenance support are documented in the literature (see Chapter VI), as is the importance of rapid maintenance response.

The Dudley Knox Library is currently implementing a *NOTIS* online catalog system. That project is consuming the bulk of time available to the Systems staff and will continue to do so in excess of one year into the future. It is the author's impression that support of CD-ROM hardware by existing Systems staff would be limited to routine maintenance of several stand-alone workstations (installing software upgrades, creating menus, running virus checks, etc.) without imposing significant impact on other duties.

Upon completion of NOTIS implementation, the existing Systems staff would be able to assume a larger workload related to CD-ROM.

The current Systems staff members (two persons) lack the training and experience necessary for installation, configuration, and maintenance of a local area network. Any plan calling for in-house maintenance support for a CD-ROM local area network should include appropriate training for the Systems staff.

If near term installation of a CD-ROM network is contemplated, with support to be provided by the in-house Systems staff, an additional staff member should be hired. In addition to network administration, this individual could assume responsibilities related to staff training, workstation maintenance, and some user instruction if the position is structured in a manner similar to the University of California, Santa Cruz position described in Appendix K.

The campus MIS and LRC staffs are potential sources for maintenance support of either stand-alone or networked CD-ROM workstations. The Library, MIS, and LRC organizations report to the Dean of Computer and Information Services. A commitment to rapid response to requests for unscheduled CD-ROM system maintenance should be accepted by any supporting staff. If a CD-ROM local area network is installed and supported, near-full time services of a network administrator will be required by the library during

network installation and the early stages of network operation. Support personnel will be required to provide training to library staff members in routine network troubleshooting and operation.

If a "turn-key" CD-ROM network is selected for implementation, maintenance support will be provided under the purchase contract, with one staff member (trained by the vendor) assigned to install software upgrades and affect minor configuration changes.

#### **D. RECOMMENDED IMPLEMENTATION STRATEGY**

The above recommendations encompass a broad range of possible scenarios that could support an implementation strategy chosen by Dudley Knox Library managers. This section provides the author's recommendation for an overall CD-ROM implementation strategy for the Dudley Knox Library.

An incremental approach to CD-ROM implementation is recommended. This will allow for effective planning, development and implementation of user and staff training programs, and reduce risk of generating excessive demand on staff resources. The specific recommended sequence of events is as follows (some events will take place concurrently as appropriate):

- Make preliminary decisions (see Sub-section C1).
- Form CD-ROM Implementation Team. Assign responsibilities for various functions addressed in Subsection C4. Monitor execution as necessary.



Designate some chronological objectives (milestones) for CD-ROM implementation.

- Initiate a second workstation trial using a bibliographic index database product for which high user demand is expected.
- Identify an initial suite of CD-ROM products from those identified in Appendices B and C for implementation in both the Reader Services and Research Reports departments. Four and two products are suggested for those respective departments.
- Develop handouts and quick reference material to support users of initial product suite. Develop outline, select location, and obtain hardware for support of a CD-ROM demonstration in connection with library tours.
- Implement the initial suite of products on stand-alone workstations using guidelines recommended in Sub-subsection C4c.
- Monitor user acceptance, usage rates, and impacts on staff workload and other library services (online, ILL, etc.) from initial suite of products. Continue planning process for service expansion.
- Expand CD-ROM collection within limits of available funding and staffing.
- When justified by the conditions discussed in Chapter VII and Sub-subsection C4c above, implement a CD-ROM local area network. Employ one of the network maintenance support strategies discussed in Sub-subsection C4d. Implement a "turn-key" network system if local technical support can not be provided for network design, installation and maintenance.
- CD-ROM Implementation Team continue to evaluate effectiveness of existing CD-ROM services, evaluate newly released products, plan product additions or deletions, recommend changes to hardware configuration, etc.
- CD-ROM Implementation Team study feasibility of remote access to library CD-ROM products via campus network(s) or modem. If a decision is made to provide this service, cooperate with campus MIS staff in implementation.

## **E. GENERAL OBSERVATIONS**

If implemented, CD-ROM databases should be properly supported at a level consistent with the policy decisions addressed at the outset of this chapter. Key factors in the success of CD-ROM services at the Dudley Knox Library will include:

- Effective planning.
- Sustained support from library managers.
- Adequate funding.
- Effective integration of CD-ROM with other library services, including measures to assist patrons in matching available sources to their information needs.
- Careful evaluation and selection of CD-ROM products.

## APPENDIX A

### INTERVIEW WORKSHEET

1. Collection development:
  - a. How are CD-ROM databases chosen for use in the library?
    - Any faculty involvement (non-library staff)?
      - If so, how was it obtained/coordinated?
    - Criteria for evaluation of candidate databases.
  - b. What sources proved useful for information on databases?
    - Any "trial copies" evaluated?
  - c. Are databases purchased through a single source (e.g. SilverPlatter)
  - d. How is the cost of CD-ROM databases justified?
2. Hardware selection:
  - a. What type of workstation arrangement is installed?
    - (network, stand alone, combination, etc)
  - b. How was the existing hardware suite selected?
  - c. Was the hardware and or software supplied by a vendor in a "package"?
    - If so, was their service satisfactory?
  - d. Who maintains the hardware (vendor or own staff)?
  - e. Any chronic problems with hardware?
3. User and staff training: .
  - a. How much user training is provided? How often?
  - b. Can users teach themselves to effectively use the databases via user guides and quick references?

- c. What types of manuals or other reference materials are maintained at the workstations?
  - d. Is user assistance with searches provided on demand?  
-If so, is there a lot of demand?
  - e. Is there a recurrent requirement for staff training?
  - f. Do different user interfaces for various databases present problems to users?
4. CD-ROM impact on other library services:
- a. Changes in volume of on-line searches, inter-library loan requests, etc?
5. Cost or space savings:
- a. Has CD-ROM allowed the library to realize any cost or space savings?
  - b. Any reduction in hard-copy subscriptions?
  - c. Any planned use of CD-ROM for archiving?
6. Effect of CD-ROM implementation on library manpower requirements?
- a. What is size of library staff?
  - b. How many people available to assist CD-ROM users?
  - c. Are students employed and if so, are they involved with CD-ROM support?
  - d. Any full or part time in-house technical support staff for CD-ROM?
  - e. Any staffing changes specifically driven by CD-ROM?
7. Distributing CD-ROM
- a. Is any wide area networking service (campus backbone net, etc.) provided or planned to support access to CD-ROM by users outside the library?

8. Printing and Downloading
  - a. What provisions are made for user printing or download to floppy disk?
  - b. Any related library policies that have proven necessary or prudent?
9. Tracking CD-ROM use:
  - a. Is any data gathered regarding who is using CD-ROM?  
- If so, how?
  - b. Any data kept regarding frequency of use of particular products?  
- If so, how?
  - c. Any known software available to collect such data?
10. Security Issues:
  - a. Any problems with theft of disks or reference material?
  - b. What sort of controls in place?
11. Lessons learned:
  - a. Things to look out for during CD-ROM implementation.

## APPENDIX B

### DUDLEY KNOX LIBRARY CD-ROM PRODUCT SURVEY

#### CANDIDATE COMMERCIAL PRODUCT LIST

##### Section 1

The CD-ROM products described below are considered to offer "strong potential value" to the Knox Library based on review by the Reader Services and Research Reports Librarians. Products are listed in order of relative priority for implementation, as determined by the Reader Services Librarian. Where versions of the same database are offered by more than one publisher, those listed in this section reflect choices that maximize commonality among user interfaces. Alternative versions of some products are listed in Section 3.

Key to symbols adjacent to product titles:

- 123 -review page # from CD-ROM Collection Builder's Toolkit 1991 (Nicholls)
- \* -publisher's literature available in product binder (maintained in Knox Library)
- ‡ -review from other source available in product binder.

**Title:** IEE/IEEE Publications OnDisc \* ‡  
**Provider:** Institution of Electrical Engineers, Institute of Electrical and Electronics Engineers  
**Publisher:** UMI (University Microfilms International)  
**Distributor:** UMI  
**Update:** monthly  
**Software:** UMI CD-ROM Retrieval Software  
**Price:** \$28,000/year; \$21,000 for subscribers to all IEEE/IEE journals; \$16,000 for subscribers to all IEEE/IEE journals, conference proceedings, and standards.  
**No. of Discs:** 25 per year.  
**Coverage:** 1988-  
**Subj:** newspapers, periodicals & books, science & and technology  
**Equivalent:** IEE Publications, IEEE Publications

**Description:** Contains the full text of the entire collection of IEE and IEEE journals and conference proceedings and a complete set of IEEE standards.

**Title:** DIALOG OnDisc: Aerospace Database \*

**Provider:** American Institute of Aeronautics and Astronautics/ Technical Information Center

**Publisher:** Dialog Information Services, Inc.

**Distributor:** Dialog Information Services, Inc.

**Update:** quarterly

**Software:** Dialog OnDisc Manager 3.0

**Price:** 1991-present: \$3450 (\$2760 for print subscriber; +\$3450 for LAN w/1-10 workstations). 1986-present: \$4890 (\$3912 for print subscriber; +\$4890 for LAN w/1-10 workstations)

**Coverage:** 1986-present

**Subj:** science and technology; aerospace

**Equivalent:** DIALOG file 108; Science and Technical Aerospace Reports, International Aerospace Abstracts.

**Description:** Comprehensive international coverage of scientific and technical literature related to aerospace engineering.

**Title:** Dialog OnDisc: Ei Compendex Plus 258-260 \*

**Provider:** Engineering Information, Inc.

**Publisher:** DIALOG Information Services, Inc.

**Distributor:** Engineering Information, Inc.; DIALOG Information Services, Inc.; Udata; Michigan Library Consortium

**Update:** quarterly

**Software:** DIALOG OnDisc Manager 3.0 (DIALOG Information Services, Inc.)

**Price:** \$3450 current year plus previous year; \$4920 current year plus 4 years backfile.

**Site License:** 2-10 workstations: \$3450 additional (current year plus 1 year backfile), \$4920 current year plus 4 years backfile).

**Subj:** science and technology

**Equivalent:**

**Description:** Covers engineering and technical literature. EI's workstation will include a document ordering and fulfillment system using document images and facsimile transmission. It will also include the tables of contents of key engineering publications.

**Title:** Business Periodicals Index 227-228 \*

**Provider:** H.W. Wilson Company

**Publisher:** H.W. Wilson Company

**Distributor:** H.W. Wilson Company; Michigan Library Consortium  
**Update:** quarterly  
**Software:** WILSONDISC - ver 2.2 (H.W. Wilson Company)  
**Price:** \$1495 annual subscription; includes unlimited online access to AST file on Wilsonline. No additional charge for networking.  
**Coverage:** July 1982-present  
**Subj:** economics, business & finance  
**Equivalent:** Business Periodicals Index  
**Description:** Citations to articles and book reviews, research developments, new product reviews and reports of associations, societies, and conferences.

**Title:** GAO Masterfile, 1976-1989  
**Provider:** General Accounting Office  
**Publisher:** International Archives Institute, Inc. (InterArc)  
**Distributor:** Chadwyck-Healy, Inc.  
**Price:** \$2050, including "On Campus" networking  
**Coverage:** 1976-1989  
**Subj:** history (United States), government information  
**Equivalent:**  
**Description:** Contains an index and abstracts to every public document produced by the General Accounting Office from 1976 to the present.

**Title:** Foreign Broadcast Information Service Daily Reports  
\*  
**Provider:** NewsBank, Inc.  
**Publisher:** NewsBank, Inc.  
**Distributor:** NewsBank, Inc.  
**Update:** monthly  
**Software:** NewsBank Electronic Index  
**Subj:** library and information science, history (except U.S.)  
**Description:** Index to the microfiche version of the Foreign Broadcast Information Service Daily Reports.

**Title:** Jane's (individual databases listed in priority order)

Fighting Ships 319 \*  
Infantry Weapons  
Underwater Warfare Systems  
C3I Systems  
Military Communication  
Aircraft  
Radar & Electronic Warfare Systems



**Avionics  
Military Logistics**

**Provider:** Jane's Information Group  
**Publisher:** Jane's Information Group  
**Distributor:** Jane's Information Group  
**Update:** yearly  
**Software:** Romware (Nimbus Information Systems)  
**Price:** \$795 single copy; discounts for multiple copies, multiple titles, hardcopy purchase. Combined disc with 14 Jane's titles: \$8000. Network: 1-4 nodes: \$100 each node; 5 or more nodes: \$75 each node.  
**Coverage:** annual  
**Subj:** military and naval history  
**Equivalent:** corresponding Jane's hardcopy publication  
**Description:** Annual in-depth surveys of military equipment in use world-wide.  
**Remarks:** Requires VGA display. Requires PC Paintbrush program and laser printer to print photographs. Text may be printed on any printer.

**Title:** Newspaper Abstracts OnDisc 170-172 \*  
**Provider:** UMI (University Microfilms International)  
**Publisher:** UMI (University Microfilms International)  
**Distributor:** UMI (University Microfilms International)  
**Update:** monthly  
**Software:** UMI CD-ROM Retrieval Software - ver. 1.5  
**Price:** depends on newspapers selected and whether library already has paper index subscriptions; ranges from \$1500 to \$2950. Site licenses optional.  
**Coverage:** 1985-present (1987+ for New York Times; 1989+ for Washington Post)  
**Subj:** newspapers, periodicals and books  
**Equivalent:**  
**Description:** Provides access to 7 major national and regional newspapers, including the New York Times and the Wall Street Journal. A library can customize its subscription to desired newspaper indices.

**Title:** PAIS International  
**Provider:** PAIS-Public Affairs Information Service, Inc.  
**Publisher:** Silverplatter Information, Inc.  
**Distributor:** Silverplatter Information, Inc.; Abt Books; American Books, Inc.; Bureau of Electronic Publishing; The FAXON Company; EBSCO Subscription Services; Readmore Publications, Ltd.; Sistemas Logicos; Transtech International Corporation; Udata; library networks.  
**Update:** quarterly  
**Software:** SPIRS (Silverplatter Information, Inc.)  
**Price:** \$1995

**Site license:** 2-4 simultaneous users: \$2992.50; 5-8 users \$3990. **Coverage:** 1972-present  
**Subj:** social sciences, economics, business & finance, political science  
**Equivalent:**  
**Description:** New product for Silverplatter. Contains thesaurus. Broad coverage index of economic, political and social publications.

**Title:** NTIS on SilverPlatter \*  
**Provider:** National Technical Information Service  
**Publisher:** Silverplatter Information, Inc.  
**Distributor:** Silverplatter Information, Inc.; Abt Books; American Books, Inc.; Bureau of Electronic Publishing; The FAXON Company; EBSCO Subscription Services; Readmore Publications, Ltd.; Sistemas Logicos; Transtech International Corporation; Updata; library networks.  
**Update:** quarterly  
**No. of discs:** 2  
**Software:** SPIRS (Silverplatter Information, Inc.)  
**Price:** \$2850  
**Site license:** Up to 8 simultaneous users: \$4275  
**Coverage:** 1983-present  
**Subj:** government information, science & technology  
**Equivalent:**  
**Description:** Bibliographic citations and abstracts to government sponsored research and development reports produced by the National Technical Information Service.

**Title:** Applied Science & Technology Index 311-312 \*  
**Provider:** H.W. Wilson Company  
**Publisher:** H.W. Wilson Company  
**Distributor:** H.W. Wilson Company; Michigan Library Consortium  
**Update:** monthly  
**Software:** WILSONDISC - ver 2.2 (H.W. Wilson Company)  
**Price:** \$1495 annual subscription for current file. One-time backfile fee of \$560. Includes unlimited online access to AST file on Wilsonline. No additional fee for network.  
**Coverage:** October 1983-present  
**Subj:** science and technology  
**Equivalent:** Applied Science and Technology Index (print)  
**Description:** Contains about 272,000 citations to articles, book reviews, interviews, new product reviews, and selected letters to the editor in 336 English language publications in the applied sciences. Covers aeronautics and space science, chemistry, computer science, construction industry, electric and electronics industry, energy resources and research, fire prevention, food, industry, geology, machinery,

mathematics, metallurgy, oceanography, physics, plastics, textiles, transportation and all engineering fields.

**Title:** MathSci Disc 249-250 \*  
**Provider:** American Mathematical Society  
**Publisher:** Silverplatter Information, Inc.  
**Distributor:** Silverplatter Information, Inc.; Abt Books; American Books, Inc.; Bureau of Electronic Publishing; The FAXON Company; EBSCO Subscription Services; Readmore Publications, Ltd.; Sistemas Logicos; Transtech International Corporation; Udata; library networks.  
**Update:** semiannual  
**No. of discs:** 2  
**Software:** SPIRS (Silverplatter Information, Inc.)  
**Price:** \$4324 annual subscription; \$2162 for subscribers to Math Review  
**Site License:** \$6486; \$3243 for subscribers to Math Review. Limit 8 simultaneous users.  
**Coverage:** 1981-present  
**Subj:** education & training, science & technology, mathematics  
**Equivalent:** Mathematical Reviews; Current Mathematical Publications  
**Description:** Contains all the reviews and abstracts from Mathematical Reviews (1981-) plus bibliographic records from the current awareness journal, Current Mathematical Publications.

**Title:** Supertech Abstracts Plus \*  
**Provider:** Bowker A&I Publishing  
**Publisher:** Bowker A&I Publishing  
**Distributor:** R.R. Bowker  
**Update:** quarterly  
**Software:** proprietary (Online Computer Systems)  
**Price:** \$1295 1-year subscription plus shipping; \$3691 3-year subscription; multiple copy discounts available.  
**Site License:** 2-4 simultaneous users: 1.5x single user price. 5-10 simultaneous users: 2.0x single user price.  
**Coverage:** 1971-  
**Subj:** library & information science, science & technology  
**Equivalent:** CAD/CAM Abstracts; Artificial Intelligence Abstracts; Robotics Abstracts.  
**Description:** Covers the computer and control technology field with retrospective and current data from CAD/CAM Abstracts, Robotics Abstracts, and Artificial Intelligence Abstracts.  
**Remarks:** Bowker license agreement requires inclusion of suitable notice of copyright on all copies of reproduced portions of the database.

**Title:** ABI/INFORM ONDISC 226-227 \*  
**Provider:** UMI (University Microfilms International)  
**Publisher:** UMI  
**Distributor:** UMI  
**Update:** monthly  
**Software:** UMI CD-ROM Retrieval Software - ver. 1.5  
**Price:** \$4590 annual subscription; backfiles 1971-1980 and 1981-1986: \$3750 each; discounts available for multiple purchases; site license available.  
**Coverage:** Backfile discs available for periods 1971-80 and 1981-86.  
**Subj:** newspapers, periodicals & books, economics, business & finance.  
**Equivalent:**  
**Description:** Contains the most recent 5-6 years of the ABI/INFORM database. It includes full bibliographic citations plus 150 word abstracts to over 800 business journals. Extremely easy to use, yet offers many search techniques such as logical operators and field limiting.

**Title:** Congressional Masterfile II, 1970-1988 ‡  
**Provider:** Congressional Information Service, Inc.  
**Publisher:** Congressional Information Service, Inc.  
**Distributor:** Congressional Information Service, Inc.  
**Update:** quarterly  
**No. of discs:** 2  
**Software:** Quantum Leap (produced by Quantum Access)  
**Price:** inquire from publisher, varies with library size  
**Coverage:** 1970-present  
**Subj:** history (United States), government information, political science.  
**Equivalent:** CIS on Dialog; Major CIS retrospective print indexes  
**Description:** Detailed index and bibliographic guide to congressional committee hearings (published and unpublished), reports, documents, and committee prints from 1970-1990.

**Title:** Dissertation Abstracts Ondisc 156-157 \*  
**Provider/Publisher:** UMI (University Microfilms International)  
**Distributor:** Same  
**Update:** monthly  
**Software:** UMI CD-ROM Retrieval Software - ver 1.5  
**Price:** current, \$1695; backfile (2 disk set) \$5495  
**Subj:** education and training, library and information science  
**Coverage:** 1861-present

**Description:** Current edition has bibliographic citations and 350 word abstracts to over 120,000 doctoral dissertations from 7/84-17/87. Backfile (Archival) Edition has two discs -- 700,000 citations from 1861-6/80 and 140,000 citations/abstracts from 7/80-6/84.

**Title:** GPO on Silverplatter \* §  
**Provider:** U. S. Government Printing Office  
**Publisher:** SilverPlatter Information, Inc.  
**Distributor:** Silverplatter Information, Inc.; Abt Books; American Books, Inc.; Bureau of Electronic Publishing; The FAXON Company; EBSCO Subscription Services; Readmore Publications, Ltd.; Sistemas Logicos; Transtech International; Udata.  
**Update:** bi-monthly  
**Software:** SPIRS (Silverplatter)  
**Price:** \$630; network up to 8 simultaneous users: \$945.  
**Coverage:** 1976-present  
**Subj:** political science, government information  
**Equivalent:**  
**Description:** Contains citations on government publications such as books, reports, studies, serials, maps, and more from the Monthly Catalog and published by the Government Printing Office.

**Title:** DODISS Plus \* Current NPS subscription  
**Provider:** Information Handling Services  
**Publisher:** Information Handling Services  
**Distributor:** Information Handling Services  
**Update:** bi-monthly (every 60 days)  
**Software:** custom (Reference Technology, Inc.)  
**Price:** \$1050 for 1 year subscription; government discounts available  
**Coverage:** 1950-present  
**Subj:** military and naval history, military/federal standardization documents.  
**Equivalent:** individual print copies of standards and specifications  
**Description:** Contains detailed summaries of over 45,000 active military/federal standardization documents and references to over 150,000 historical standardization documents ranging back to the 1950's.

**Title:** Book Review Digest 154 \*  
**Provider:** H.W. Wilson Co.  
**Publisher:** H.W. Wilson Co.  
**Distributor:** H.W. Wilson Co.; Michigan Library Consortium  
**Update:** quarterly

**Software:** WILSONDISC - ver 2.2  
**Price:** \$1095 annual subscription; includes unlimited online access to BRD database on Wilsonline. No charge for network.  
**Coverage:** January 1983-present  
**Subj:** language and literature, library and information science.  
**Equivalent:** Book Review Digest  
**Description:** Contains citations to current reviews of English-language books. Includes excerpts of reviews and covers popular and scholarly works of fiction and non-fiction, and juvenile fiction. Sources include over 80 periodicals published in the U.S., Canada and U.K.

**Title:** Readers' Guide Abstracts 173-175 \*  
**Provider:** H.W. Wilson Company  
**Publisher:** H.W. Wilson Company  
**Distributor:** H.W. Wilson Company, Michigan Library Consortium  
**Update:** quarterly  
**Software:** WILSONDISC - ver. 2.2  
**Price:** \$1995 annual subscription; includes unlimited online access to RGA database on Wilsonline. No charge for network.  
**Coverage:** Jan. 1983-present (indexing); Sept. 1984-present (abstracts)  
**Subj:** library & information science, language & literature  
**Equivalent:** Readers' Guide to Periodical Literature Abstracts (microfiche)  
**Description:** Contains abstracts and indexing for about 200 general interest magazines as cited in Readers' Guide to Periodical Literature. Abstracts contain up to 150 words. Includes all of the indexing of Readers' Guide with the exception of entries for book reviews and works of creative literature.

## Section 2

The Research Reports Librarian recommends implementation of the following products (among those listed in Section 1) in the Research Reports Division spaces:

All Jane's products  
Foreign Broadcast Information Service Daily Reports  
NTIS on SilverPlatter  
GAO Masterfile  
GPO on SilverPlatter

### Section 3

The following products are alternative versions of databases listed in Section 1.

**Title:** GPO Monthly Catalog & Index to Periodicals \*  
**Provider:** U.S. Government Printing Office  
**Publisher:** H.W. Wilson Company  
**Distributor:** H.W. Wilson Company; Michigan Library Consortium  
**Update:** annually  
**Software:** WILSONDISC - ver 2.2  
**Price:** \$995 annual subscription; includes unlimited online access to GPO database on Wilsonline  
**Coverage:** July 1976-present  
**Subj:** political science, government information  
**Equivalent:** Monthly Catalog of United States Publications  
**Description:** Contains citations to the publications of U.S. government agencies, including the U.S. Congress. Price includes GPO and Index to U.S. Government Periodicals on one disc. Covers Senate and House hearings on bills and laws as well as agency-sponsored studies, fact sheets, maps, handbooks, bibliographies and conference proceedings. Subjects covered include agriculture, economics, energy, public affairs, taxation, law, health, consumer issues, and environment.

**Title:** Government Publications Index on InfoTrac \*  
**Provider:** U.S. Government Printing Office  
**Publisher:** Information Access Company  
**Distributor:** Information Access Company  
**Update:** monthly  
**Software:** proprietary (Information Access Company)  
**Price:** Annual subscription includes all hardware, software, maintenance, customer service and monthly updates: \$2500 (12 months). Without hardware: \$1500.  
**Coverage:** 1976 to present  
**Subj:** political science, government information  
**Equivalent:**  
**Description:** Index to the Monthly Catalog of the Government Printing Office. Includes indexing to public documents generated by legislative and executive branches of the U.S. Government beginning with 1976.

**Title:** Government Documents Catalog Service  
**Provider:** Auto-Graphics, Inc.  
**Publisher:** Auto-Graphics, Inc.  
**Distributor:** Auto-Graphics, Inc.

**Update:** monthly, quarterly and bimonthly  
**Software:** IMPACT (Auto-Graphics, Inc.)  
**Price:** \$1600/year (monthly); \$950/year (bimonthly);  
\$650/year (quarterly); includes software, CD-ROM, user  
manual, toll-free support.  
**Coverage:** June 1976-present  
**Subj:** government information, newspapers, periodicals &  
books  
**Equivalent:** Monthly Catalog of U.S. Government Publications  
**Description:** An enhanced version of the complete Monthly  
Catalog of U.S. Government Publications. Database has been  
corrected and processed according to current Library of  
Congress authorities. Provides full Boolean search and  
record downloading capabilities.

**Title:** PAIS on CD-ROM 205-207 \* %  
**Provider:** PAIS-Public Affairs Information Service, Inc.  
**Publisher:** PAIS-Public Affairs Information Service, Inc.  
**Distributor:** PAIS-Public Affairs Information Service, Inc.;  
Udata  
**Software:** Online Computer Systems  
**Price:** \$1600 for annual lease. \$1045 for full subscribers  
to PAIS International in print.  
**Coverage:** 1972-present  
**Subj:** social sciences, economics, business & finance,  
political science  
**Equivalent:** PAIS International (online); PAIS Bulletin  
(1976-1990); PAIS Foreign Language Index (1976-1990), PAIS  
International in Print (1991 to present).  
**Description:** Provides bibliographic indexes with English  
language abstracts and index headings to public policy  
literature of business, economic, government, etc. Covers  
all material in English, French, German, Italian,  
Portuguese, and Spanish published worldwide.

**Title:** DIALOG OnDisc: NTIS 260-261 \*  
**Provider:** National Technical Information Service (NTIS)  
**Publisher:** DIALOG Information Services, Inc.  
**Distributor:** DIALOG Information Services, Inc.; Udata;  
Michigan Library Consortium  
**Update:** quarterly  
**Software:** DIALOG OnDisc Manager 3.0  
**Price:** \$2350 annual license fee: current year + 4 years  
backfile; \$3650 current year + 10 years backfile  
**Coverage:** 1980-1990; 1986-1990  
**Subj:** government information, science and technology  
**Equivalent:** DIALOG file #6  
**Description:** U.S. government-sponsored research,  
development, and engineering reports and analyses prepared



by federal agencies, their contractors and grantees. Contains abstracts of unclassified, publicly-available reports, software packages and data files for 300 government agencies including NASA, DOD, DOE, EPA, DOT, and Department of Commerce. Some state and local government agencies are also included.

#### **Section 4**

During the initial phase of the product survey, these CD-ROM products were considered to offer potential value to the Knox Library as indicated, based on a joint evaluation by the Reader Services and Research Reports librarians.

**Subsection 1. CD-ROM products judged "of moderate value to the library" (Category B):**

**Telecommunications Abstracts  
Computer Database  
Predicasts F&S Index plus Text  
sociofile  
Time Magazine Compact Almanac, 1990  
Monterey Bay Regional Sampler  
Disk I - US Federal Government  
DOD Standardization Service  
Specmaster  
PERSONNET  
CD-FICHE  
General Periodicals OnDisc  
General Periodicals Index/Academic Library Edition on InfoTrac  
British Newspaper Index on CD-ROM  
Dialog OnDisc: METADEX Collection: Metals, Polymers, Ceramics  
Robotics**

**Subsection 2. CD-ROM products judged "of uncertain value to the library" (Category C):**

**National Trade Databank  
Yearbook  
GEOREF  
Personnel and Naval Engineering Manuals  
World Development Indicators**

**Subsection 3. CD-ROM products judged "'nice to have', but of lesser value/priority" (Category D):**

**International Financial Statistics**  
**IntlEc CD-ROM: Index to International Economics, Development and Finance**  
**ERIC - Current Files**  
**ERIC on Silverplatter**  
**Dialog OnDisc: ERIC**  
**Consumer Reports on CD-ROM, 1985-present (beginner's edition)**  
**College Blue Book on CD-ROM**  
**Congressional Masterfile I, 1789-1969**  
**Humanities Index**  
**Book Review Digest**  
**Washington Post**  
**Wall Street Journal Ondisc**  
**National Newspaper Index on InfoTrac**  
**Science Citation Index Compact Disc Edition**  
**Social Sciences Index**  
**Social Sciences Citation Index Compact Disc Edition**

**Sources:** The material in Sections 1 and 3 originally appeared in CD-ROMS IN PRINT 1991, copyright 1991 Meckler Publishing, 11 Ferry Lane West, Westport, CT 06880; (203) 226-6967. Reused with permission. In some cases, product price, update frequency, and coverage information has been updated to reflect more recent publishers' marketing literature.

## APPENDIX C

### DUDLEY KNOX LIBRARY CD-ROM PRODUCT SURVEY

#### CANDIDATE U.S. GOVERNMENT DATABASES

##### Section 1

The CD-ROM products described below are considered to offer "strong potential value" to the Dudley Knox Library by one or both of the Reader Services and Research Reports Librarians.

**Title:** Federal TAURUSdisc

**Number of Discs:** 1

**Search Software:** ROMWARE

**Update Frequency:** Quarterly

**Price:**

**Description:** Full text search and retrieval capabilities for FAR, DFAR, FIRMA, OMB Circulars, Board of Contract Appeals protest decisions, select FIPS, etc.

**Data Provider:** Various government agencies

**Vendor:** National Technical Information Service (NTIS)

**Title:** NAVINST - Navy Directives on CD-ROM

**Number of Discs:** 2

**Search Software:** Lasertex

**Update Frequency:** quarterly

**Price:** Available to appropriate Department of the Navy personnel

**Description:** One disc contains the retrieval software and database of DON directives. The second disc contains the same images at high resolution for printing.

**Data Provider:** Department of the Navy (Navy Computer and Telecommunications Command)

**Vendor:** Navy Publishing and Printing Service Management Office.

**Title:** Arctic and Antarctic Regions (Cold Regions)

**Number of Discs:** 1

**Search Software:** CD-Answer

**Update Frequency:** semi-annual

**Price:** \$795/yr

**Description:** Over 260,000 citations and abstracts from eight databases covering Arctic and Antarctic Regions, 1950-present.

**Data Provider:** Various Government agencies  
**Vendor:** National Information Services Corp. (NISC)

**Title:** NOAA Library Information Network Catalog - NOAALINC  
**Number of Discs:** 1  
**Search Software:** Bibliofile Intelligent Catalog  
**Update Frequency:** monthly  
**Price:** \$545/yr  
**Description:** Bibliographic records of 19 National Oceanographic and Atmospheric Administration (NOAA) libraries and information centers. Over 45,000 records related to marine science.  
**Data Provider:** derived from Online Computer Library Center (OCLC) tapes.  
**Vendor:** Library Corporation

**Title:** High Resolution Bathymetry and Selected Geoscience Data for the Monterey Bay Region  
**Number of Discs:** 1  
**Search Software:** IMDISP developed by NASA  
**Update Frequency:** N/A  
**Price:** Available for exchange to research institutions.  
**Description:** NOAA High Resolution Bathymetric Data and other data sets for the Monterey Canyon area. Includes: multi-beam bathymetric, sea beam, GLORIA side scan sonar data, digital elevation model (DEM) data, digital photographs, LANDSAT and geodetic control information.  
**Data Provider:** USGS, NOAA  
**Vendor:** USGS/NOAA Joint Office for Mapping and Research

## Section 2

The following product was considered to offer moderate potential value to the Dudley Knox Library by the Research Reports Librarian.

**Title:** Econ/Stats I  
**Number of Discs:** 1  
**Search Software:** unknown  
**Update Frequency:** one-time  
**Price:** \$65  
**Description:** Contains the Consumer Price Index, Producer Price Index, Export-Import Price Index, Industrial Production Index, Money Stock, Selected Interest Rates, Industry Employment Hours and Earnings by State and Areas, and Capacity Utilization. Some data back to 1913.  
**Data Provider:** Various government agencies  
**Vendor:** Hopkins Technology

Sources for the CD-ROM product information listed above:

USGS Library/SIGCAT CD-ROM Compendium

U.S. Geological Survey Open File-Report 91-40

U.S. Geological Survey, Reston, VA 22092-9998

The Directory of U.S. Marine CD-ROMs

U.S. Department of Commerce

NOAA Central Library

National Oceanographic and Atmospheric Administration

Rockville, MD 20852

## APPENDIX D

### DRAFT CD-ROM COLLECTION DEVELOPMENT POLICY

1. Compact Disk-Read Only Memory (CD-ROM) technology facilitates rapid and convenient electronic access to large quantities of information. Current library oriented CD-ROM applications allow library patrons to search a wide variety of databases on their own. CD-ROM resources available include:

a. Bibliographic databases providing citations and/or abstracts of books, periodicals, reports, or other resources.

b. Databases providing the full text of articles from periodicals, journals, or newspapers. These databases may be available in machine readable text format, allowing patrons to print the text of articles or download it to floppy disk. Such products do not normally provide photographs, charts, or other graphic material included in the original printed sources. Alternatively, CD-ROM products may provide electronically stored graphic images of source documents, including advertisements, photographs, charts and diagrams. These products allow duplication of the original source, similar to that provided by microfiche, but do not normally include machine readable text for download to floppy disk.

c. CD-ROM versions of large printed publications or collections of related documents. Examples include: encyclopedias, reference indexes, manuals and government documents (e.g. Federal Acquisition Regulations).

d. Large collections of related data, such as U.S. Census statistics or environmental data.

2. The range of CD-ROM products of potential value to library patrons is rapidly expanding. At the same time, funding restrictions prevent purchase of all desirable CD-ROM resources. Therefore, CD-ROM products must be critically evaluated by the library staff to ensure that available funds are allocated to those products offering the greatest value to library patrons. CD-ROM collection development decisions must be based on careful consideration of several factors, including:

- a. Database:
  - scope (subject matter)
  - content (sources of data)
  - currency (adequacy of update frequency)
  - coverage (years/volumes included; availability of backfiles if desired)
  - number of disks utilized
  - potential value to library patrons
    - introduction of a previously unavailable resource
    - improved accessibility or utility of an existing resource
    - other enhancement of library holdings or services
  - portion of patron population expected to benefit from acquisition of product
  
- b. Retrieval software (including user interface):
  - ease of use
  - power and versatility of search tools
  - ability to tailor features and configuration to match library policies
  - documentation
    - user instructions
    - quick reference
    - installation and configuration
  - commonality with software already in use in the library
  - print and download options
  
- c. Hardware requirements:
  - compatibility with currently installed hardware
  - any special or additional hardware requirements
  
- d. Publisher/Distributor
  - reputation for quality products
  - adequacy and responsiveness of product support
  
- e. License agreement
  - lease vs purchase of disks
  - restrictions on distribution of data or simultaneous access
  
- f. Cost of implementation
  - price of CD-ROM product
    - subscription
    - any desired backfiles
  - price of any additional hardware required
  
- g. Potential impact on other library services
  - reference staff
  - staff and user training requirements

- inter-library loan
- online services

3. The following general guidelines are established for CD-ROM collection development within the Dudley Knox Library:

a. CD-ROM products chosen for implementation shall support one or more of the following objectives:

- provide additional resources not currently available in the library through any medium.

- significantly improve patron ability to independently and efficiently search reference resources.

- provide wider access to resources currently available to patrons only on a limited basis (e.g. online databases).

b. Primary emphasis in selection of CD-ROM products shall be given to the scope, content, currency and coverage of the database. These characteristics should be evaluated together against the objectives stated above.

- Preference shall be given a product providing in-depth coverage of a specific field of study versus a product providing more cursory coverage of broader scope.

- Preference shall be given to databases best suited to support of graduate level and faculty research.

c. Secondary considerations include:

- Full text databases may be preferred over indexes, particularly where a significant enhancement of library holdings will result. Given the higher subscription fees associated with many full text products, careful consideration must be given to value added versus cost. Any potential decrease in inter-library loan activity will be considered an added value.

- Databases offering a user interface common to other products currently implemented within the library or (during initial CD-ROM collection development) considered highly desirable, will be preferred over products of comparable value with unique interfaces.

- Frequency of update for bibliographic databases should be considered adequate to justify reliance upon the product as a primary search tool for Knox Library patrons. The subject matter covered by the product must be considered in this evaluation.



-When evaluating a CD-ROM version of a print index, demand history of the print version, as well as any differences in content or coverage, should be considered.

d. The degree to which non-full text database coverage matches Knox Library holdings shall not be a primary consideration in CD-ROM collection development.

e. When considering purchase of any resource for the library, the potential added value to the library's patrons must be weighed against the costs of purchasing and supporting the product. CD-ROM is no exception. Quantifiable costs for subscriptions, one-time back-file purchases, additional hardware, and on-going support (printer paper, etc.) should be identified. The potential "value added" by a given product is difficult, if not impossible, to quantify. The experience and judgment of the library staff must be relied upon in this regard. Other costs, such as impact of a product on staff workload or staff/user training requirements must be considered but may only be fully understood after implementation.

f. New CD-ROM products are often reviewed in library journals. These reviews may provide useful opinions regarding potential CD-ROM purchases and should be consulted when available.

g. Most CD-ROM distributors offer 30-90 day free trial periods for their products. Such trial periods provide an opportunity for library staff to carefully evaluate a product on a first-hand basis. In some cases, it may be desirable to make a product available for public access during a trial to assess user acceptance and impact on staff workload. As a general rule, candidate CD-ROM products should be evaluated by the library staff on a trial basis, if offered without obligation by the distributor. Such trials must conform to guidelines established by the Naval Postgraduate School Supply Department.

## **APPENDIX E**

### **COMPUTER SELECT**

#### **Typical Search Sequence**

1. **Pre-plan your initial search strategy.** If possible, do this before occupying the workstation. See Chapter 2 of the printed or on-line User's Guides for planning tips.
2. With "Computer Select" highlighted on the workstation menu, press **ENTER**.
3. The Computer Select copyright screen will appear. Press any key to continue.
4. The Section Selection Window will appear. Use **arrow keys to highlight desired database section for search** (or the on-line User's Guide). Press **ENTER**.
5. Conduct a word or field search as described in the User's Guides and quick reference material.
6. Browse full text documents and abstracts identified by search.
7. If necessary, expand or narrow your search by modifying your search criteria. Conduct a new search of the entire database section or confine it to the "domain" of documents identified in a previous search. Browse and repeat this step as necessary. Mark useful documents for later download (use **INS** key within Titles or Browse screens) as you browse your final search results.
8. If desired, download search results to floppy disk. Refer to Quick Reference book for procedures and guidelines.
9. **Exit Computer Select.** Use the **ESC** key as necessary to return to the Log or Titles screen and select **Exit**.
10. Fill out the **User's Log**.

## APPENDIX F

### COMPUTER SELECT WORKSTATION QUICK REFERENCE GUIDES

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#### SAMPLE WORD SEARCHES

The way in which you construct your word search will have a major impact on the success of the search. The search software locates only exact "matches" for the criteria you define using words, phrases and (very importantly) the "operators" ("and", "or", "within", etc.) you employ to link those words and phrases.

#### Examples:

1. local area network security Documents found: 4

Search will locate only those instances where the words in the phrase appear exactly in the above sequence in the text of articles.

2. local area network and security Documents found: 412

Search will locate all articles within which the phrase "local area network" and the word "security" appear together or independently.

3. (local area network or lan) and security  
Documents found: 1292

Search results will be similar to those of example 2, but will also include instances in which the commonly used abbreviation "lan" appears in place of the phrase "local area network". Note the use of parentheses to define the limits of the "or" operation.

4. (local area network or lan) within2s security  
Documents found: 403

Search will locate all articles within which the word "security" appears within 2 sentences of either the phrase "local area network" or the word "lan". The "withinxx" operator can be used to improve the likelihood that the words and phrases used in the search

are related in context within the article. This technique may help if previous searches yielded too many documents unrelated to the search objective.

5. **#4 and (virus protection or antivirus)**  
Documents found: 36

Exemplifies another technique used to narrow a search. In this case, a search for "virus protection or antivirus" was conducted within only the documents identified by results of a previous search (Log entry #4). The results of this search includes documents dealing with virus protection issues related to local area network security.

**DOWNLOADING SEARCH RESULTS  
TO  
FLOPPY DISKS**

**DOWNLOAD POLICIES:**

You may download Computer Select search results to a formatted 3.5" (720KB or 1.44MB) or 5.25" (360KB) floppy disk. Formatted disks are not available in the library. Blank disks may not be formatted on the Computer Select workstation. Disk formatting may be accomplished in one of the academic department PC labs.

You may elect to download a single document, all documents found during a search, only documents you "marked" while browsing search results, or only the paragraphs containing "matches" of your search criteria.

Each execution of the Computer Select Copy option creates a single ASCII text file on your floppy disk. You may create additional files, add documents to an existing file, or overwrite an existing file by repeating the Copy option, specifying each time the file name and material to be downloaded.

The Print feature of Computer Select may not currently be utilized at this workstation. Printing may be accomplished in one of the NPS computer labs or using your home computer. You can easily import downloaded files into a word processing program such as WordPerfect. Procedures for importing Computer Select files into WordPerfect are provided in this binder for your convenience.

**\*\*\*CAUTION\*\*\***

Some of the documents you choose to download may require considerable disk space. If you try to group too many documents together in a single file (single execution of the Copy function), you may receive a message informing you of inadequate remaining free disk space. If disk space is a problem, reduce the number of documents marked for download or use another disk.

## DOWNLOAD PROCEDURE

1. Select the **Copy** option from any screen. The options presented by subsequent menus will depend on the screen you start from and whether you "marked" any documents. If you want to copy the full text of documents, ensure "Copy text" is selected.

2. **SUGGESTED ROUTINE:**

**Note:** For detailed procedures and options, see Chapter 8 (Title # 60) of the on-line User's Guide or page 8-4 of the printed User's Guide)

- a. **To download single or multiple document(s) :**

- (1) Mark the document(s) (highlight on the Titles screen and press **INS**, or press **INS** while viewing the contents of each desired document on the Browse screen).
- (2) Select **Copy** from the menu (or press **ALT-M**). The Copy Options menu will appear. Select desired options using **INS**.
- (3) Press **Enter**.
- (4) Specify destination drive and filename as described below. Then press **Enter**.
- (5) If you enter an existing file name, you will be prompted to specify whether the copied document(s) should be added to the end of the old file or written over it (will destroy existing contents of file).

3. **Drive/Filename Entry Format:**

- a. Substitute a filename for the X's in the appropriate format. Filenames may be one to eight characters in length. You may include a three-character suffix preceded by a period (.) (Standard MS-DOS filename conventions apply).

- (1) 5.25" 360KB: B:\XXXXXXXX

- (2) 3.5" 720KB or 1.44MB: A:\XXXXXXXX

**4. Alternate Procedure for Downloading Results of Multiple Searches**

- (1) As you browse results of each search, mark documents for later download using **INS**.
- (2) Create a separate Log entry for the marked documents by selecting **Log** (or pressing **ESC**) from the **Titles** screen. Enter a name describing the contents of the marked documents when prompted to do so.
- (3) When ready to download documents, highlight (on the Log screen) a log entry containing only documents previously marked for download. Select **Copy** from the menu and proceed as described above.
- (4) Repeat this procedure as needed for remaining log containing documents chosen for download.

**IMPORTING COMPUTER SELECT FILES  
INTO  
WORDPERFECT 5.1**

Computer Select downloads files to floppy disks in ASCII format. You can import these files into WordPerfect and if desired, edit and save them as you would a file created by WordPerfect. Suggested procedure:

1. Insert the floppy disk containing your downloaded Computer Select file into the appropriate drive of a PC running WordPerfect.
2. Start with a blank WordPerfect document screen.
3. Use the WordPerfect **Format** function (**SHIFT-F8**) to set the left and right margins to 0.5". Return to the blank document screen.
4. Press **CTRL-F5**.
5. Enter 1 (DOS text) at the first prompt.
6. Enter 2 (Retrieve) at the second prompt.
7. Enter the path (drive and directory) and filename of the Computer Select file, then press **ENTER**. Examples:

A:\CASETOOL      Drive: A, "Root directory"  
                  Filename: CASETOOL

B:\COMSELEC\CDROM    Drive: B, CASETOOL directory  
                  Filename: CDROM

A:\DOWNLOAD\PRINTERS.TXT    Drive: A, DOWNLOAD directory  
                  Filename: PRINTERS.TXT

8. WordPerfect will retrieve your Computer Select file and display it on the document screen. You may now save or edit as you would any other WordPerfect file. When saving the WordPerfect version of your Computer Select file to the same disk from which the ASCII version was retrieved, you should assign a new name to the saved file if you wish to retain the ASCII version.

9. For more detailed instructions or discussion of options related to WordPerfect, refer to your WordPerfect manual. To use Computer Select ASCII files with other word processing programs, refer to appropriate program-specific documentation.



## APPENDIX G

### COMPUTER SELECT

#### STAFF INDOCTRINATION CHECKLIST

1. Powering up and securing the workstation.
  2. Using the CD-ROM drive.
  3. Starting Computer Select:
    - from the Menu
    - from DOS
  4. The Log Screen and Section Selection Window.
  5. Log Screen menu options and accelerator keys.
  6. Introduce on-line User's Guide.
  7. Articles Database
    - Domain
  8. Sample Word Search
    - word search features:
      - 10 word limit
      - booleans (and, or, not)
      - parenthesis
      - phrases / 4-word limit
      - proximity operators (within w/s/p)
    - refining searches
      - domain change
      - F2, F3, "# and"
    - wildcards and wildcard word lists
  9. Sample Field Search
    - numeric and alphanumeric fields
    - field type vs. database section
    - field templates
    - moving around templates (4-10)
      - F4, gray +/-, pg up/dn, arrow keys, RTN, INS, ESC,
- F9
- naming a field search
  - amending a field search
  - changing field values (4-19)

10. Viewing Titles
  - Titles Screen
  - Moving within Titles Screen
    - shift home/end, pg up/dn, ESC
  - Menu options/accelerators
11. Browsing
  - Browse Screen
  - Moving within Browse Screen
    - pg up/dn, arrows, shift arrows, gray +/-
12. Marking
13. Downloading
  - procedure
  - entering remark for top of document
  - path and file name
  - adding to an existing file
14. Documentation
  - Users Guide (print)
  - Workstation signage



**COMMENTS/RECOMMENDATIONS:** Please provide comments/recommendations as desired. If you desire a response, leave name and SMC or phone number.

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**When page is full, place this form at bottom of stack and continue on next sheet.**

## **APPENDIX I**

### **CD-ROM WORKSTATION QUICK REFERENCE SHEETS**

This appendix provides examples of quick reference material maintained at CD-ROM workstation at the U.S. Naval Academy (USNA) and the University of California, Santa Cruz (UCSC). Several additional examples from various institutions are available in Spec Kit 169, published by the American Library Association (ALA 1990).



UNITED STATES NAVAL ACADEMY  
NIMITZ LIBRARY

CD-ROM SEARCH TIPS

APPLIED SCIENCE AND  
TECHNOLOGY INDEX  
GENERAL SCIENCE INDEX

The Applied Science and Technology Index on CD-ROM includes references to professional journal articles in science and technology; approximately 350 journals are indexed on the disc which includes October 1983 to present. Updated quarterly.

The General Science Index on CD-ROM includes references to journal articles in all fields of science; approximately 100 journals are indexed on the disc and coverage is from May 1984 to the present. Updated quarterly.

**BASIC SEARCH HINTS:**

- \*\* Follow the prompts on the bottom of the screen to search, display or print.
- \*\* To download citations: complete search; insert disc in A drive; display first record; press ALT-P; at PRN prompt, type in A:<FILENAME>; hit F6 function key.
- \*\* Check journal titles in the Periodicals Holdings List to make sure Nimitz has the journals referenced. The Nimitz Library does not necessarily have all journals indexed on the CD-ROMs.

**SEARCH METHODS:**

**BROWSE** allows selection of topics from an alphabetical list of subjects similar to the controlled vocabulary of the printed index.

- \*\* If a term is listed alphabetically but has no postings, use the F8 function key to learn the exact wording of the subject heading and to see related terms.
- \*\* To find information about a person, use Browse entering the last name first.

**WILSEARCH** allows subjects, keywords, and other elements such as journal or author's name to be combined through use of a menu screen. The computer searches the terms in both titles and subject headings.

- \*\* Terms can be truncated by the use of the # symbol for a single character or : for multiple character truncation. For example, ship: would yield citations containing the word ship, shipbuilding, shipment, shipping, ships, etc. Ship# would yield ship or ships.
- \*\* To search a list of synonyms, input them on one line separated by spaces and preceded by the word ANY. For example: ANY ships submarines warships is interpreted by the computer as ships or submarines or warships.
- \*\* To combine a known subject heading with a keyword in the Wilsearch mode, precede the subject heading with a /, then enter the additional terms on the next line.
- \*\* Wilsearch allows a personal name to be searched as an author or as a subject.

*For help in using this or any CD-ROM, Please ask a Reference Librarian!*

dh/pp/rh 7/90

USNA quick reference sheet for Applied Science and  
Technology Index.



**UNITED STATES NAVAL ACADEMY  
NIMITZ LIBRARY**

**RESEARCH GUIDE**

**APPLIED SCI. & TECH. INDEX  
PERIODICALS IN NIMITZ**

Use Journal Name in WILSEARCH mode to search periodical titles.

AAPG Bulletin	Computer Journal
ACI Structural Journal	Corrosion Science
ACM Trans. on Database Systems	Consulting Engineer
ACM Trans on Math. Software	Consulting-Specifying Engineer
Advanced Materials & Processes	Control Engineering
Aerospace America	Corrosion
AIAA J	Cryogenics
AIChE J	Datamation
Air Progress	Design News
American J of Physics	EDN
American J of Science	ENR
American Scientist	EPRI Journal
Analytical Chemistry	Electrical Communication
Applied Optics	Electronics
Artificial Intelligence	Electronics and Wireless World
ASHRAE J	Energy Conversion & Management
ASTM Standardization News	Engineer
AT&T Technical Journal	Engineering
Automotive Engineering	Engineering Digest Environmental
Automotive Industries	Science & Technology
Aviation Week & Space Tech.	Experimental Mechanics
Bulletin Am. Meteorological Soc.	Experimental Techniques
Byte	Geological Society of America
Civil Engineering (ASCE)	Bulletin
Communications of the ACM	Geology
Computer	Hydraulics & Pneumatics
Computer Design	IBM Journal of Research and
	Development

USNA quick reference guide listing Applied Science and Technology Index periodicals held by the Nimitz Library.



**UNITED STATES NAVAL ACADEMY  
NIMITZ LIBRARY**

**CD-ROM SEARCH TIPS**

**COMPENDEX PLUS (ENGIN INFO)  
NTIS (NATL TECH INFORMATION SVC).**

**PROGRAM TELLS YOU:**

Select Search Mode

Select Main Activity

Search Options

Type Search Term

**YOUR ACTION:**

Highlight: **Easy Menu Search**

Highlight: **Begin a New Search**

Highlight: **Word/Phrase Index**

Example: **Solar Energy**

As you type in your search, a list will appear of subject headings filling your request and the number of records.

Highlight: **Solar Energy**

Press: **F10**

This program tells you how many records fill your request.

Modify existing Search

Type in the additional term.

Highlight: **Limit with Additional Concepts or Terms**

Example: **Batteries**

Press: **F10**

USNA quick reference handout for COMPENDEX Plus and NTIS CD-ROM databases (page 1 of 2).



**PROGRAM TELLS YOU:**

**YOUR ACTION:**

The program will combine terms and give the total number of records.

Select Main Activity

Highlight: **Display print or Transfer the Selected Record(s).**

Display Format Options

Highlight: **Complete Record**

Press **F8** to Print

Press: **F8**

Adjust Options, then Print or Transfer to file.

Highlight: **Print Currently Displayed Record only. Repeat for Each Record as Needed.**

This program will limit your search to NASA documents only.

Select Search Mode

Highlight: **Easy Menu Search**

Select Main Activity

Highlight: **Begin a New Search**

Search Options

Highlight: **Number Options/ Report Number**

Type: **NAS**

USNA quick reference handout for COMPENDEX Plus and NTIS CD-ROM databases (page 2 of 2).



UNITED STATES NAVAL ACADEMY  
NIMITZ LIBRARY

USING THE CD-ROM LOCAL AREA  
NETWORK

Nimitz Library has a new local area network for its CD-ROM (Compact Disk-Read Only Memory) databases. The network is available in the Library Reference area and provides access to seven CD-ROM databases from any network workstation. Access to the network is available only through workstations in Nimitz Library.

The CD-ROM databases available through the network provide bibliographic information about periodicals, government documents, and books in many subject areas.

**CD-ROM NETWORK DATABASES**

**GPO** is the index to documents issued by the U.S. Government Printing Office from 1976 to the present.

**PAIS** (Public Affairs Information Service) provides international coverage for resources in international affairs, political science, and economics from 1972-present.

**Humanities Index** provides references to journal articles in history, literature, art, and music from 1984 to the present.

**Social Sciences Index** provides references to journal articles in all fields of social sciences from February 1983 to present.

**MLA** (Modern Language Association) **Bibliography** covers scholarly articles, dissertations, and books in language and literature from 1981 to the present.

**General Science Index** provides references to journal articles in all fields of science from October 1984 to present.

**Applied Science and Technology Index** covers approximately 350 professional journals in the sciences and technology from October 1983 to the present.

**Aquatic Sciences and Fisheries Abstracts** provides indexing for resources on the science and technology of marine and freshwater environments. Coverage is provided on two disks: 1982-1986 and 1987 to the present.

**USING THE NETWORK**

CD-ROM network terminals are designated by the *blue menu screen*. Use the menu to select the appropriate database. *It is not necessary to change workstations or disks to access any network database!* Workstations with red menu screens are dedicated to specific databases and are not connected to the network.

To change databases, use ESC (Escape) to return to the main menu and then select the desired database.

After completing a search, always use ESC (Escape) to return to the main menu. This will make usage tracking more accurate.

Many of the CD-ROM databases available through the network use unique software. For specific instructions on using each database, see the reference librarian or choose the appropriate CD-Rom Search Guide from the display rack near the Reference Desk.

Not all items indexed in the CD-ROM databases are available in Nimitz Library. To determine if a periodical is in Nimitz Library, check the Periodicals Holdings List in the Reference area. To determine if a book is in Nimitz Library, check the Geac Online catalog. For help in finding a government document in Nimitz Library, check with the reference librarian on duty.

*Donna Hurley/Reference Branch/August 1991*

USNA quick reference guide explaining use of the CD-ROM network.



# THE MATHSCI DATABASE ON CD-ROM

## A Quick Reference Guide

MathSci is a comprehensive database which contains references to recent publications in a wide range of disciplines including mathematics, statistics, computer science, operations research, econometrics, etc. It includes the information from two printed sources: Mathematical Reviews and Current Mathematical Publications published by the American Mathematical Society.

### HOW TO START A SEARCH

Press [F2] for FIND prompt.

SilverPlatter v 1.5

MathSci Disc 1/85-6/89

At the FIND prompt, type a keyword or keywords. Then press [RETURN].

To look for:

A keyword      FIND: linear  
or  
keywords      FIND: correlation coefficients

Example: Type linear at the FIND prompt → FIND: linear

No. Request	Records
#1: linear	54497

### HOW TO COMBINE CONCEPTS

OPERATOR	EXAMPLE	RECORDS	RECORDS
A and B	correlation and coefficients	400	records which contain both A and B.
A not B	correlation not coefficients	4794	records that contain A, but exclude any records which contain B.
A with B	correlation with coefficients	156	records which contain A and B in the same field, not necessarily adjacent to each other.
A or B	correlation or coefficients	15635	records that contain either A or B or both.

UCSC quick reference guide for the MathSci CD-ROM database (page 1 of 2). Used by permission.

## HOW TO LIMIT A SEARCH

A. Combine additional terms with the and operator.  
Type linear and travel and cost at the FIND prompt.

A. SilverPlatter v 1.5 MathSci Disc 1/85-6/89

No. Request	Records
#1: linear	54497
#2: travel	119
#3: cost	2031
#4: linear and travel and cost	8

FIND: linear and travel and cost

B. Limit a previous set by publication date:  
Type #4 and py=1988 at the FIND prompt.

B. SilverPlatter v 1.5 MathSci Disc 1/85-6/89

No. Request	Records
#1: linear	54497
#2: travel	119
#3: cost	2031
#4: linear and travel and cost	8
#5: #4 and py=1988	1

FIND: #4 and py=1988

C. Also try limiting your search terms to the title (ti) or descriptor (de) field.

\* PY is FIELD NAME for publication year.

### C. Selected Searchable Fields

Field Name	Search Examples
au author	jones-leslie-f in au
ti title	linear in ti
de descriptor	correlation in de
la language	!a=English or English in la
py publication year	py=1988 or py < 1987 or py > 1983 or py= 1985-1989

### Frequently used commands

TO RESTART THE SYSTEM	Press F7.
TO LEAVE THE SYSTEM	Press ESC key.
TO SHOW RECORDS FOUND	Press F4.
TO DISPLAY THE NEXT SCREEN	Press [PGDN].
TO DISPLAY THE PREVIOUS SCREEN	Press [PGUP].
TO PRINT RECORDS	Press F6

\* For more questions about CD-ROM MathSci, please ask Reference Librarians, or call X 2886.

WW/1/24/90

UCSC quick reference guide for the MathSci CD-ROM database (page 2 of 2). Used by permission.

## **APPENDIX J**

### **ELECTRONIC RESOURCE GUIDES**

This appendix provides extracts of handouts used at the U.S. Naval Academy and the University of California, Santa Cruz. These handouts assist library patrons in selection of electronic resources appropriate to their information needs.

Material originating at the University of California, Santa Cruz is used by permission.



**UNITED STATES NAVAL ACADEMY  
NIMITZ LIBRARY**

**RESEARCH GUIDE**

**COMPACT DISC SERVICES**

**APPLIED SCIENCE AND TECHNOLOGY INDEX**

References to professional journal articles in science and technology; approximately 350 journals indexed. CD covers October 1983 to present. Updated quarterly. Print version, dating from 1926, on Index Table 2.

**NETWORKstation**

**AQUATIC SCIENCES AND FISHERIES ABSTRACTS**

A comprehensive database on the science and technology of marine and freshwater environments. References, including journals, conference proceedings and technical reports are covered on two discs: 1982-1986 and 1987 to the present. Updated semi-annually.

**NETWORKstation**

**BOOKS IN PRINT PLUS**

Listing of all books presently available from publishers; many of the newer books also include full text of reviews. Updated quarterly. Print equivalent at Ready Reference.

**Workstation 06**

**CENSUS OF AGRICULTURE (1987)**

Information on land use, chemicals, dairy, livestock etc. by state and county.

**Workstation 04**

**COMPENDEX PLUS**

References to Engineering professional journal articles, technical reports and conference proceedings are covered on two discs. 1989 and 1990. Updated quarterly. Print version Engineering Index available from 1892 to the present.

**Workstation 16**

**COMPUTER SELECT**

Current information on computer-related topics. Updated monthly. Coverage from 1987 to the present.

**Workstation 12**

**CONGRESSIONAL RECORD**

Prototype disc of Proceedings and debates of the 99th Congress first session, January 3, 1985 to December 20, 1985.

**Workstation 04**

**CONSTITUTION PAPERS**

A collection of documents relating to the Constitution of the United States. Some of the titles are: Mayflower Compact, Common Sense, Federalist Papers, etc. Will not be updated.

**Workstation 07**

**COUNTY BUSINESS PATTERNS**

Data on two discs 1986-1987, 1987-1988

**Workstation 04**

**DTIC (USNA Faculty, Staff and Midshipmen only)**

The Defense Technical Information Center disc provides access to DoD scientific and technical reports.

**Workstation 18**

**ECONLIT**

Comprehensive, indexed bibliography with selected articles of the worldwide literature on Economics from over 300 major economics journals. Coverage 1988 to present. Updated quarterly.

**Workstation 14**

Extract of USNA handout describing CD-ROM resources available in the Nimitz Library.

# COMPUTER-BASED INFORMATION RESOURCES IN THE SCIENCES

U C S C  
SCIENCE  
LIBRARY

## INTRODUCTION

A wide variety of scientific information resources are now available in electronic form and are available for your use, both in the Science Library, and from laboratories, offices and colleges connected to the campus network. Many of the indexes and abstracts you may be familiar with in their printed format have been acquired by the library in computerized versions, some of which are mounted locally while others are accessible through network or telephone connections. Regardless of where the data actually reside, computer-based searching give you powerful means of retrieving information on a broad range of topics.

Outlined below are the primary types of electronic information systems available. On the following pages selected databases in the major scientific subject disciplines are listed. Each database is labelled with a graphical icon to indicate what format is available. For assistance in selecting the database that will best answer your information need, and for help with constructing effective search strategies, consult with a librarian at the Reference Desk in the Science Library.



### MELVYL<sup>2</sup> LIBRARY SYSTEM DATABASES

In addition to containing records for the book and periodical collections of the UC libraries, the Melvyl Library System offers a number of indexes to journal and newspaper articles. Terminals located throughout the library provide access to these Melvyl databases. UC students, faculty and staff may also connect to the Melvyl System from outside the library via modem dialup, the campus network, or from any Internet connection. Remote access to the periodical indexes requires a password, which may be obtained at the Reference Desk or Circulation Desk in the Science Library.



### NETWORKED CD-ROMs

Many databases are now distributed on read-only compact discs, or CD-ROM. Several of the products available in the library are mounted on a local area network in the S.H. Cowell Room, allowing more than one person to use each database simultaneously, and enabling you to search several different discs from each computer station. There is no charge for the use of these databases.



### STANDALONE CD-ROMs

Some of the databases offered on CD-ROM cannot be loaded on the library's network, due either to technical limitations or licensing restrictions. These discs may be used by one person at a time on any of the standalone CD-ROM computer stations in the S.H. Cowell Room, each of which has a compact disc player attached. The discs themselves are kept at the Reserves Desk and may be checked out for two hours at a time. There is no charge for the use of these databases.



### \$ COMPUTER REFERENCE SERVICE

The library provides access to hundreds of additional databases offered through commercial database vendors such as Dialog Information Services and STN International. In many instances the databases on these systems are more comprehensive and cover more years than those on CD-ROM or Melvyl. Searches on these databases are conducted by librarians who have training in the use of each system's retrieval language. The library provides a partial subsidy of the cost of these searches to UCSC students, faculty and staff. Charges for these online searches are based both on the length of time it takes to run the search and on royalties for each citation or item that is printed, displayed or saved to disk. Contact the Reference Desk (459-2886) for more information or to make an appointment for a search.



### LASERDISCS

A mix of photographic images, animated sequences and text that can be searched and manipulated with a HyperCard interface. A Macintosh laserdisc station is located in the S.H. Cowell Room; discs circulate for two hours from the Reserves Desk.

SW 991

Extract from UCSC handout describing computer-based information resources in the Science Library. Used by permission.

## MARINE, ENVIRONMENTAL AND EARTH SCIENCES DATABASES



### AQUATIC SCIENCES AND FISHERIES ABSTRACTS

A comprehensive database of references to the international literature on biological, ecological and physical aspects of marine, freshwater and estuarine environments. Also covers fisheries, aquaculture and environmental pollution. One disc covers 1988+.



### CLIMATEDATA--HOURLY PRECIPITATION

This disc contains data from the U.S. National Climatic Data Center recording hourly precipitation measurements from weather stations throughout the Western U.S., with most records dating from 1948+.



### CLIMATEDATA--U.S. SUMMARY OF THE DAY

This disc contains daily data on temperature, precipitation, snowfall and evaporation recorded at stations across the country by the U.S. National Climatic Data Center, with most records dating from 1948+.



### CURRENT CONTENTS

An up-to-date index of over 6,000 core academic and research journals in all scientific disciplines, as well as social sciences and humanities. Updated weekly, with coverage from July 1989+. On Melvyl type START OC.



### ENVIRONMENTAL PERIODICALS BIBLIOGRAPHY

An index to the primary environmental journals, most of which are readily available in the UCSC collections. Covers both the social, political and scientific aspects of environmental studies. One disc covers 1973+.



### \$ GEOARCHIVE

Indexes the geosciences literature from over 5,000 journals, plus books, proceedings and technical reports. Dialog File 58, with coverage from 1974+.



### \$ GEOREF

Corresponding to the Bibliography & Index of Geology and its predecessors, GEOREF provides comprehensive indexing of the geological literature, including all USGS publications. Searching capabilities include latitude/longitude searching for specific geographic regions. Dialog File 89, with coverage from 1785+.



### \$ ENVIROLINE

Indexes a broad range of environmental information sources, including NTIS technical reports. A good research-level database, including many publications beyond the scope of the UCSC collection. Dialog File 40, covering 1971+.



### HYDRODATA--PEAK VALUES & DAILY VALUES

These two discs contain data recording stream flows and lake levels both daily and in terms of peak values. Data are collected by the U.S. Geological Survey and cover as many as 100 years of reports from stations in the Western U.S.



### HYDRODATA--QUALITY OF WATER

This disc contains data on water quality measurements for both surface water and groundwater for the Western region of the U.S. drawn from the U.S. Geological Survey's WATSTORE database.

Extract from UCSC handout. Used by permission.



**APPENDIX K**

**POSITION DESCRIPTION:  
INFORMATION SYSTEMS SPECIALIST**

The position described below exemplifies one approach to staff augmentation for support of electronic information resources in a library.

**INFORMATION SYSTEMS SPECIALIST**

**JOB #91-03-30**

**FULL TIME/CAREER**

**SALARY: \$2530/month**

**SUMMARY OF DUTIES:** Under general supervision, the incumbent will assume responsibility for advanced operational level administration of the S.H. Cowell data access room; supervise student assistants; provide technical support for related computing equipment; and train and assist library users and staff, in the new Science Library. Specific duties include: **Operations:** manage the daily operation of the data access room; administer a Novell NetWare Ethernet local area network and a Unix-based, full-text and graphical image database system; assist in the development of new library software applications; oversee system security; maintain inventory of computing equipment and software; recruit, hire, schedule, and train student assistants. **Technical:** troubleshoot equipment problems; coordinate equipment repair and recommend replacements/upgrades; coordinate system backups and installation of new software and hardware. **Training/Assistance:** teach classes, in conjunction with other Science Library staff, on the use of electronic information resources and supporting equipment; train library staff in the technical aspects of network resources; oversee set-up of equipment for group instruction and demonstrations; assist users in the data access room.

**REQUIRED SKILLS, KNOWLEDGE, AND ABILITIES:** General understanding of the relationship of electronic information systems to library practices and procedures or equivalent knowledge in a non-library setting; demonstrated knowledge of DOS-based microcomputer hardware and software, and/or Unix-based workstation hardware and software; supervisory skills and training; strong interpersonal and communication skills; ability and skills to teach classes on the use of the library's network and microcomputing resources; ability to manage the data access room network with connections to local printers and the campus network. *Prefer:* experience with advanced microcomputer workstations and local area networks; previous library experience; knowledge of Macintosh hardware and software.

Used by permission of the University of California,  
Santa Cruz

## APPENDIX L

### REPRESENTATIVE HARDWARE CONFIGURATIONS

The hardware listings below provide representative costs for implementation of each of the four configuration options described in Chapter VII. Inclusion of specific hardware products does not infer superiority of those products in comparison with others of similar capability. No formal product survey was performed.

Shipping, installation and network cable costs are included only in the "Turn-key" package, since they are an included feature of that package.

A standard workstation configuration is applied to all of the four options. The workstation hardware was selected with the following objectives: 80386 processor, support for downloading to 3.5 inch and 5.25 inch floppy discs, adequate hard disc capacity to support local mounting of application software, and a color monitor.

A specific printer is not included in the workstation configuration. They are commonly included in library CD-ROM installations. Ink Jet printers offer reduced noise level and are commercially available in the \$500 range. Cost of printers should be added to the figures presented below.

#### Price sources:

Workstation and file server hardware, including CD-ROM drives: SMC contract  
Monochrome monitor: Computer Select  
CBIS products: GSA contract  
SilverPlatter products: MultiPlatter Price Sheet, September 1991  
Artisoft products (Lantastic): Artisoft Price List Effective 2/1/91

**Standalone Workstations with One or More CD-ROM Drive(s)**

Each of the workstations in this configuration may be equipped with up to seven CD-ROM drives. There is no sharing of drives among workstations. Multiple products or products requiring more than one CD-ROM disc may be supported by daisy chaining an appropriate number of drives to a workstation. The components below are adequate to support eight CD-ROM discs on five workstations.

**Workstations:**

CPU: 80386 25 MHz, 4 MB RAM, 128 KB cache,  
VGA card, SVGA monitor, 40 MB IDE hard drive,  
IDE drive controller, 3.5 in. and 5.25 in.  
floppy disk drives, keyboard, DOS 5.0, 8-  
bit SCSI adapter w/software \$2455

Total Workstations: 12275

**CD-ROM Drives:**

CD-ROM Drive 666

Total Drives: 5328

Total System: \$17603

### Peer to Peer Network

This configuration uses CD-ROM drives mounted at one or more of the networked workstations, shared on a peer to peer basis without a central file server. The components below are adequate to network the eight CD-ROM drives and five workstations employed in the Standalone Workstation configuration. Drives may be mounted as described for the Standalone Workstations.

#### Workstations:

CPU: 80386 25 MHz, 4 MB RAM, 128 KB cache, VGA card, SVGA monitor, 40 MB IDE hard drive, IDE drive controller, 3.5 in. and 5.25 in. floppy disk drives, keyboard, DOS 5.0, 8- bit SCSI adapter w/software	\$2455
---	--------

Total Workstations:	12275
---------------------	-------

#### CD-ROM Drives:

CD-ROM Drive	666
--------------	-----

Total Drives:	5328
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#### Network Components:

Lantastic Ethernet Starter Kit	\$699
Additional Lantastic adapters (\$299 each)	897

Total network components	1596
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<b>Total System</b>	<b>\$19199</b>
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### Server Based Network

The components below will support a server based network with 10 CD-ROM workstations. The CBIS CD Server and Expansion Chassis will provide 14 centrally located CD-ROM drives. Software is not listed, except for MS-DOS, the network operating system, and CD-ROM network software.

#### CD-ROM Server:

CBIS CD Server/386 CD-ROM Server	\$3508
Expansion Chassis (7 drive)	1600
CD-ROM Drives (14 @ \$564 each)	7896
Monochrome Monitor	113
network card	150
CBIS CD Connection (10 users)	695
Total CD-ROM Server	13962

#### Network File Server:

CPU: 80386 33 MHz, 8 MB RAM, 128 KB cache, VGA card, SVGA Monitor, 80 MB IDE hard drive, IDE drive controller, 3.5 in. and 5.25 in. floppy disk drives, keyboard	2928
network card	150
Novell Netware 386 (20 users)	1223
Total Network File Server	4301

**Note:** If only CD-ROM applications will be shared on the network, the file server may be omitted. In this case, search and retrieval software for each CD-ROM product must be loaded on every workstation from which it will be accessed. No network statistical or other utility software may be supported. The CBIS CD-ROM server is a dedicated server with no hard drive.

Server Based Network (cont.)

Workstations:

CPU: 80386 25 MHz, 4 MB RAM, 128 KB cache, VGA card, SVGA monitor, 40 MB IDE hard drive, IDE drive controller, 3.5 in. and 5.25 in. floppy disk drives, keyboard, DOS 5.0	2207
network card	150
Total each workstation:	2357
Total ten workstations:	23570
<b>Total system</b>	<b>\$41833</b>
Total system with no file server	\$38755

## Turn-key Network System

This configuration uses a "package" of network hardware, software, installation, training, and maintenance support as described in Chapter VII. The components below are adequate to support 14 CD-ROM discs and ten workstations.

### MultiPlatter System Components

Basic Multiplatter System Server Unit	\$17895
Includes: CD-ROM Network Server, seven CD-ROM drives, 2MB RAM, 80286 processor, four Ethernet network interface cards, all necessary network software, MultiPlatter Application Manager Software, system testing, shipping, installation and training.	
80386 processor upgrade	1750
Expansion Unit (seven additional drives)	8000
Support packages for six additional workstations	3000
Includes Ethernet card, 20 feet of cable, MultiPlatter Application Manager software and network software license for one additional workstation (\$500 each)	
Total MultiPlatter components	30645

### Workstations:

CPU: 80386 25 MHz, 4 MB RAM, 128 KB cache, VGA card, SVGA monitor, 40 MB IDE hard drive, IDE drive controller, 3.5 in. and 5.25 in. floppy disk drives, keyboard, DOS 5.0	2256
Total workstations	22560
Total system	\$53205

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